Master Thesis

Daylight in Architecture: Mental Health Center, Tehran

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“ I sense Light as the giver of all presences, and material as spent Light. What is made by Light casts a shadow, and the shadow belongs to Light.”

---- Louis Kahn ---

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Acknowledgement

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Abstract

The psychological illnesses can directly influence the lives of individuals and consequently emerge as social dilemmas. Unfortunately in recent years, some countries such as Iran, have neglected to cope with these concerns which have resulted in millions suffering from anxiety and depression. Therefore, the main purpose of this thesis, will be to design a suitable environment for therapy in Tehran, Iran through utilizing natural lighting.

According to studies, the groups of anxiety and depression patients have totally different environmental demands being respectively, cozy and cheerful atmosphere. Privacy has been also considered as a major common factor. Furthermore, scientific studies indicate on advantage of daylight on human biological and physiological characteristics. Apart from these influences, daylight can also play a crucial role in shaping the interior atmosphere identity. Hence, different properties of openings and their effects have been studied through 3D visualization methods. The thesis includes also studies of traditional Persian architecture and its motives of using natural light and creating spatial sense of privacy.

The result of these studies have been emerged in a design of a mental health center. In the design, different quantities and qualities of light and the level of connection between interior and outside areas create different atmospheres to support healing of different patient groups.

Introduction

1. Introduction

Architecture as a medium we are living and working in can change patterns of our behavior via mediators which are environmental variables comprising physical and cognitive factors (Veitch & Arkkelin, 1995, p. 39). Thus, consideration of these variables which are related to the architectural elements can be significant to the quality of life.

The subject of this master thesis is to design a mental health center in Tehran, Iran. The main approach of design is to study importance of natural light and visual connection between interiors and outside on providing the most suitable atmosphere for users' (patients) well-being.

1.1. The importance of subject

Through human history, mental illnesses have been one of the most agonizing troubles, which can cause drawbacks for all aspects of peoples' lives.

A mental disorder is a behavioral or mental pattern which can cause significant impairment of personal functioning (Bolton, 2008, p. 6). World Health Organization's (WHO) reported that mental disorders is one of the most common illnesses worldwide and over 300 million people around the world suffer from depression or other types of common mental disorders. It also mentioned that in long-lasting and severe intensity, it could cause the affected person to encounter more serious illnesses and poor productivity at school or work. And in its worst condition, depression can lead sufferers to suicide. According to the official statistics done by WHO, approximately 800,000 people die because of suicide every year around the world which is the second reason of mortality among youth between 15 to 29 years old. (WHO, 2001).

In Iran, 10-12 million people suffer from depression and anxiety (Sharifi et al., 2015, p.76)**.** Additionally, the other scientific study related to the prevalence of mental disorder in Tehran, Iran indicates that 23% of the participants meet the criteria of mental disorder. The most prevalent disorders are the groups of anxiety and depression including 15.6% and 14.6% respectively (Noorbala et al., 2011, p. 479). These studies point out a deteriorating mental health condition in Iran.

Therefore, this thesis aims to offer a solution to provide therapeutic spaces with consideration of natural lighting.

1.2. Architecture and mental health care services

In recent years some developed countries have started to revise the regulations in relation with mental health and the main concept is to transform concentration from healing process to prevention. As a reference, in Finland the authorities announced new rules to allocate money resources, which had been invested for healing process, to the prevention in order to approach the most optimal outcomes. All of these changes and establishment of new methods for mental health services in Finland have positively affected mental health status. The report asserts that after the reforms the statistics show 25% falling in rate of suicide in one year. (Forti, 2014, p. 4).

The main focus was in rehabilitating of prevention compared to treatment. Hence, these reforms have been revealed on transition from hospital-based to community-based mental health care services (Forti, 2014, pp. 35-39). Therefore, the new approach should change from the focused specific hospitals toward creating local centers with the easier access to public.

1.3. Importance of atmosphere design

Designing a mental health center focuses on a certain group of people and as any other space with a specific group target, in my opinion, it requires a specific atmosphere. This group of people have their own issues and it seems to be vital to recognize and consider this type of knowledge related to the users and integrate them in designing process.

In order to obtain a better understanding of an ideal atmosphere for these users, we first need to recognize their needs and characteristics in a certain space.

1.3.1. Anxiety

On the contrary of a common belief anxiety is different from fear. Essentially, fear is an appropriate emotional and cognitive response to a perceived danger, whereas anxiety is a hyper arousal, escaping and defensive behavior and it might be occurred in any perceived uncontrollable or unavoidable situation and not necessarily realistic. (Öhman, 2000, pp. 93, 573)

Moreover, some of the major emotional characteristics of anxiety are "*feelings of apprehension or dread, trouble concentrating, feeling tense or jumpy, anticipating the worst, irritability, restlessness, watching (and waiting) for signs (and occurrences) of danger".* (Folk, 2008)

1.3.2. Depression

Depression refers to a wide range of mental health problems characterized by the lack of a positive emotions, loss of interest and pleasure in daily routines and experiences, a bad mood and feeling of guilt and being worthless. (National Institute for Health and Care Excellence, 2010, pp. 17, 18).

1.3.3. Stigma and culture

A report done by WHO indicates that treatments for psychological illnesses are available in most communities, but nearly two-thirds of people with a known psychological disorder never seek the help of a doctor due to stigma and misconceptions about mental illnesses. Where there is negligence, there is little or no understanding. (WHO, 2001)

More specifically, Iranian Minister of Health at the World Health Day mentioned that 27% of individuals suffering from mental disorders in Iran have never asked health care due to their stigma related to the incorrect judgment of other community members about mental illnesses. (Agancy-Hamshahrionline, 2017)

1.4. Psychiatric therapy for anxiety and depression group

One of the common psychiatric treatment is Cognitive Behavior Therapy and it means that psychologist work with the patient to understand how negative thoughts can affect on our behaviors. In CBT's cognition component, patients learn to identify the thoughts that force them to encounter fear and stress in anxiety and lack of interest in depression and replace them with less distressing thoughts. (American Psychological Association, 2017)

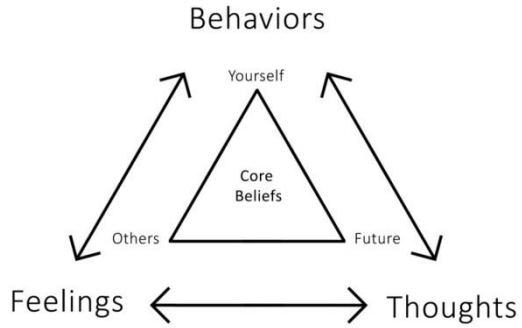


Figure 1 Cognitive Behavior Therapy

1.5. Analyzing environmental demands

Mental experts indicate that anxiety group patients are significantly jumpy or tense. I think that in environmental context, these feelings can be intensified due to stressful environment variables and lack of safety. Hence, maintaining high rate of safety and lowest environmental arousals could be the most crucial idea of atmosphere for this group.

On the other hand, depression symptoms and behavioral patterns all are overlapped on lack of enthusiasm and passion. In other words, I think that the patient suffering from depression might need to receive encouraging feelings from environment. I would like to suggest that unlike the atmosphere for anxiety group, the spaces for depressed individuals should be more provocative and cheerful.

Finally, stigma can form a virtual barrier between mental patients and health care centers. Therefore, I propose that in order to remove this obstacle, some issues such as privacy should be considered. Providing this sense of seclusion will insure that the patients will receive proper services.

Figure 2 Cheerful Bedroom

Figure 3 Cozy Work Place

1.6. Design approach

Light is one of the most important aspects of designing an environment. All visual elements such as colors, materials, textures, people and objects are meaningful thanks to light. The expression of a space is defined by intensity of light and its properties. *"The perception of space is directly connected to the way light integrates with it. What we see, what we experience and how we interpret the elements is affected by how light interacts with us and with the environment."* (Vidal Fontenelle, 2008, p. 03)

1.6.1. Active mode of architecture

An architecture with variety of spaces with different atmospheres can provide a flexible choice for patients to express themselves. This allows the patient and the therapist to use the required atmosphere in respond to their needs. I believe therapist can utilize the architecture to modify the negative emotions through CBT method of treatment. The idea is that the character of an area can be expressed through a range of different darkness and brightness. Hence, in my design, I will focus on studying architectural elements related to natural light to provide the suitable atmospheres for the groups of anxiety and depression. Furthermore, in order to minimize the disturbing features of natural light and more specifically the resulting issues from direct sunlight beams, the controller of the light will be considered. This will reduce the stressor of environment in terms of natural light while providing a changeable atmosphere by using moveable light controller to control the intensity of light.

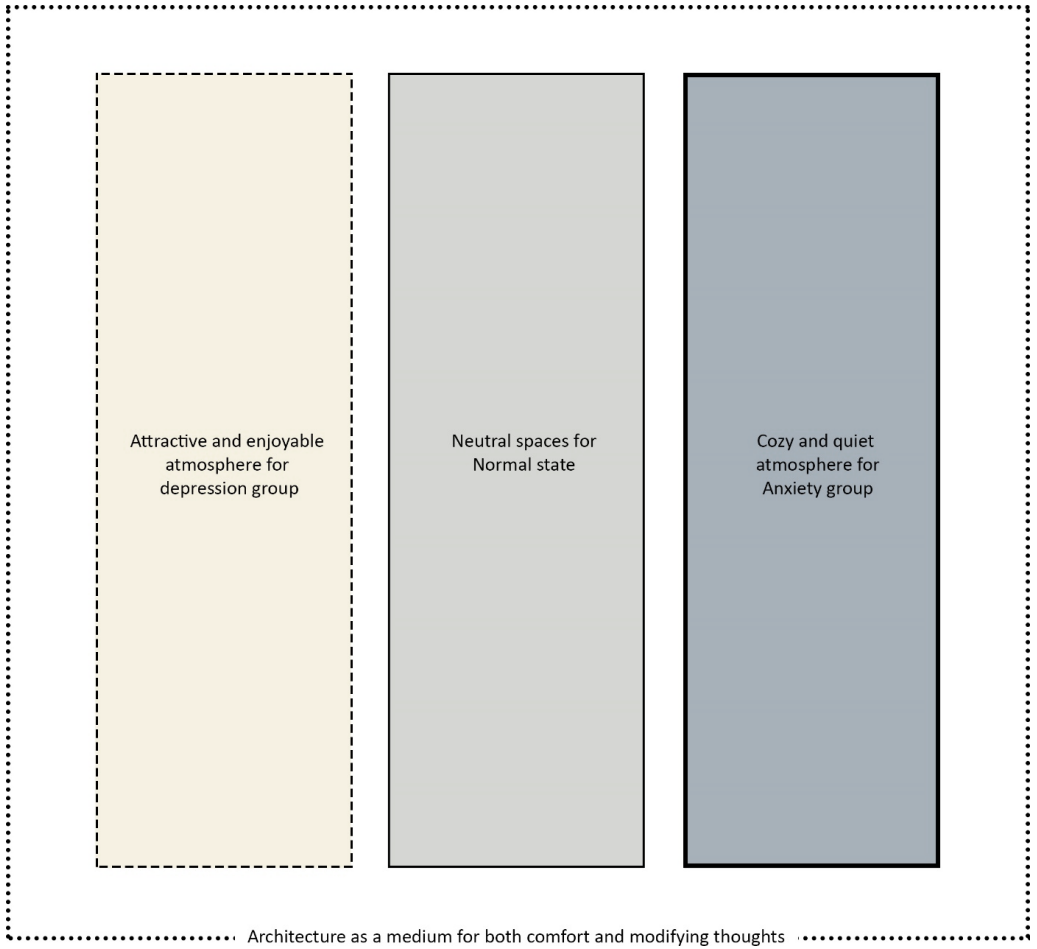


Figure 4 the Main Aims of Design

1.7. The importance of privacy

I consider the visual connection between inside and outside through openings as the most significant factor in determining privacy and publicness of a space. Generally, openings can have positive effects on the user's mood in space, as most people prefer to spend their time in a room with a window. On the other hand, privacy is a major aspect of this project hence, a balance between the privacy and publicness of the required spaces will be thought of.

Figure 5 Different Size of Openings; Different Amount of Data

Methods

2. Methods

In order to create a suitable environment for the aforementioned patient through natural lighting and sense of privacy I will use the following methods.

2.1. Literature reviews

Studying the fundamental of natural lighting in architecture provides a better understanding about the typology of different architectural elements related to daylight which is essential to this thesis subject.

Since traditional Iranian architecture is renowned for its efficient utilization of natural lighting, going through the sources of historical architecture can be insightful. Therefore, I will investigate through these components related to the natural light to find out the importance of light in Iranian architecture. Moreover, it will be useful to extract these techniques which had been used to provide the right condition for comfort of inhabitants through architectural elements related to day light.

2.2. Software analyzing of daylight and openings

3D modeling in Autodesk 3D S Max with a comprehensive rendering engine such as V-ray will provide us a practical way of visualization to study different parameters of openings and their influences on intensity and quality of light.

2.3. Case studies

Finally, in order to have a practical discernment I will survey two architectural categories of case studies. The first one will be allocated to the practices that architects used in projects to exploit day light for creating their own atmosphere:

- SK Yee Healthy Life Centre in Hong Kong to study possibility of maximum level of lighting and connection between interior and outside through architectural elements related to the daylight.
- Health Municipal Clinic in France to study the methods of using openings to equip spaces with medium level of light and privacy as the most neutral atmosphere for users and function of each space.
- House of silence in Japan has been chosen to study how the design of plan and details like apertures can provide a cozy and quite but fresh and well-lit environment for occupants.

The second category is associated with identifying space's necessities and standards for therapy institution:

- The Ballarat Community Health Primary Care Centre which is located in Lucas VIC, Australia which was designed by architects Michelle Harris and Heidi Lee in 2014.

Daylight in Architecture

3. Daylight in achitecture

3.1. Importance of daylight

It is believed that natural light is one of the main life sources on the earth. It is an obvious fact that life is impossible without natural light. Daylight maintains our fundamental demands such as adequate visibility for doing our routines and expansion of plants which is a huge portion of food source for humans.

Furthermore, light is a vital factor in mankind cognition of the environment. Through literature, we can find numerous samples trying to depict horrifying scenery without enough daylight. Albeit, human's perceptional safety and peace from their environment is directly based on vision with presence of light. In other word as it was described by Corrodi "*the assessment of a specific lighting situation is always based, consciously or unconsciously, on a comparison with experiences in daylight".* (Corrodi, Spechtenhauser, & Auer, 2014, p. 31)(Figure 6, 7 and 8)

Apart from cognitive influences of daylight, medicine and psychiatric medicine also prove that natural light through nervous of eyes stimulate our brain to produce necessary hormones to regulate our body rhythm based on time. This is one of the main reasons that we feel fatigue and falling asleep during dark. Meanwhile at dawn, the body becomes alert with the first signals of natural light. (Veitch & Arkkelin, 1995, pp. 162- 168)

However, this pattern can be disturbed without natural light, which causes some physiological and psychological effects like depression. For instance, In Nordic countries due to inadequate natural light through long winters, people might suffer from seasonal affective disorder as a type of depression. (Veitch & Arkkelin, 1995, pp. 162- 168)

Hence, based on the reasons mentioned above, we can consider daylight not only as a crucial factor for our well-being but it can help us to get rid of our negative feelings.

Figure 8 sunny wetland view, Oulu, Finland

Figure 6 cloudy mountain view, Mazandaran, Iran

Figure 7 Night lake view, Oulu, Finland

3.2. Importance of view

Almost all the techniques for inviting daylight to our interiors are merged with visual connection between inside and outside.

Generally, the exterior view of surrounding can be divided to the three main areas: sky, horizon and ground which constitute different information being crucial for our satisfaction. View of sky provides varying light exposure and information about time. However, the view of horizon maintains comforting information regarding their orientation and help us to know that we are securely tide to the earth. The view of ground gives information about ongoing activities around us. Altogether, people prefer more complex view and more frequent changes to feel more satisfied. (Evans, Daylight in Architecture, 1981, p. 28)

From my perspective, the nature of surrounding landscapes can be categorized in different context. Some might be natural scenery while others can comprise urban views or industrial sites. It cannot be said for certain which type of views can be suitable for occupants due to variety of different taste and mood of people.

However, studies assert that visual connection to the natural scenery can positively influence on our mood. The statistics show that in a hospital space natural view reduce both employees' and patients' stress, can help students to be more calm under pressure of exams, and generally the view of nature provides therapeutic influences on interiors occupants. (Strong, Hons, Oxon, & Fcibse, 2014)

To sum up the importance of a view for our well-being, I would like to assume that most people prefer to live, work and get treatment in rooms with windows. Users of the buildings desire to remain their link with outside world in some way. However, the typology of the view can be variable due to function of space and user's requirements.

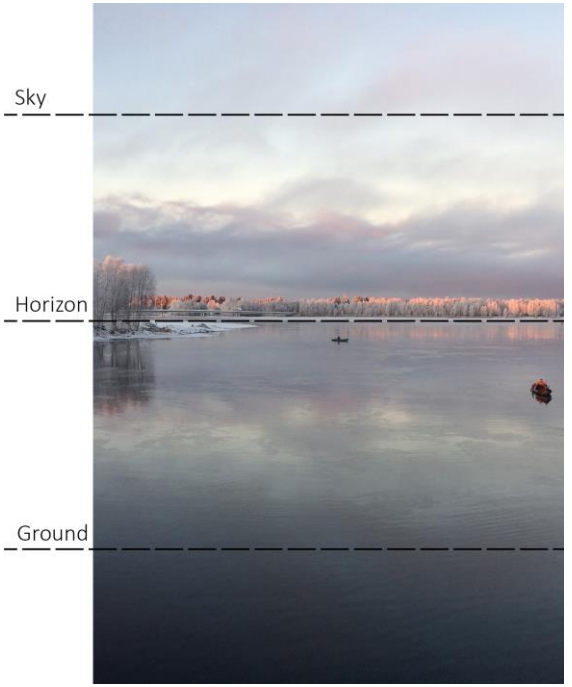


Figure 9 Main areas of exterior view: Sky, Horizon, and Ground

Figure 10 Different views, different contents and different expressions

3.3. Cozy atmosphere and Cheerful atmosphere

According to my findings and the aforementioned studies above, the combination of daylight and connection to the outside can influence the character and expression of interiors.

In my point of view, a cozy space can be associated with terms such as intimate and warm atmosphere. With a smaller amount of environmental stressors due to limited openings that cause a darker and more quite space, users can feel more secure and calmness. In other words, cozy atmosphere works as a shelter where, the users can leave all the troubles of daily routine behind and experience an enclosed space isolated from outside world. (Figure 11)

On the other hand, the user needs an atmosphere in which, he can be more active and encouraged. A strong connection with the surrounding area can be inspiring due to the large amount of constant information and the dynamic nature of it. Furthermore, opposite of the previous case, more daylight can energize and uplift the user's mood. Hence, large openings can be one of the main attribute to a cheerful atmosphere. (Figure 12)

Figure 11 Vanna Venturi house

Figure 12 Le Corbusier Villa Savoye

3.4. Negative features of natural light

Direct sunlight can cause arising glare occurrence and thermal loads for space which both can be considered as disturbing features of light in an environment. (Corrodi et al., 2014, pp. 168-170)

Glare is a disturbance of direct sunlight or artificial light sources which can cause difficulty for eyesight. The main reason of glare is a significant ratio of brightness between task and a light source. The main two types of glare are the direct glare and glare by reflection. The direct glare is caused by the origin of light itself whereas the glare by reflection is the result of indirect reflection of a light source. (Corrodi et al., 2014, p. 150)

Solar gain through windows consists of the heat transferred through the glass and the energy received via the glass and frame. Therefore, the direct sunlight can cause more heating loads in the interiors which could be disturbing for users and, increase the required energy to cool down the space. (Varkie C, 2010)

Hence, according to the disturbing features of the direct sunlight on the environment, controlling the incoming light can be a reasonable strategy to minimize stressor parameters of space.

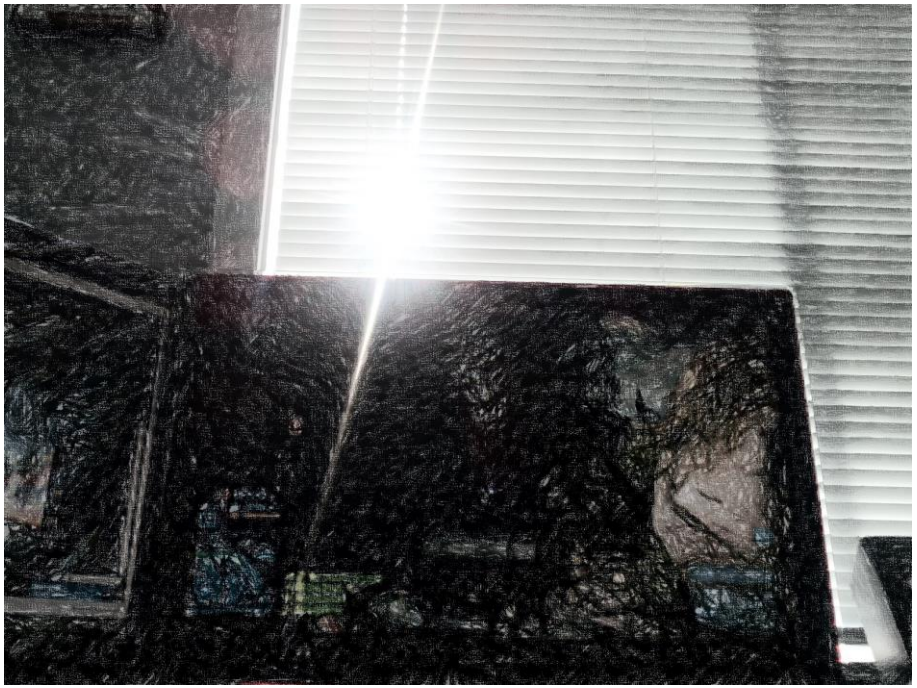


Figure 13 Direct sun light beams, Glare, and Window

3.5. Software analyses of openings and daylight

In the following, I will use 3D visualization in order to study the influences of variety of parameters related to daylight in architecture. The main objective is to create the aforementioned cheerful and cozy atmospheres with less disturbing features.

Traditionally, windows and openings are one of the architectural elements which have been used by architects to illuminate the spaces with daylight. Almost all factors related to openings like size, height, width, direction, and orientation can significantly impact the quantity and quality of light which will emerge as a result of daylighting design.

In order to understand how these parameters can be effective on my design I decided to study them via using light simulator software. In each scene, I will change the factors mentioned above and observe differences of light's intensity, penetration, distribution and quality. The virtual model of the space is a simple room in which there are piece of basic furniture for routine activities like reading, writing and seating. The room is 4 meters long and 3 meters wide along north-south axis. The height of ceiling is 3 meters.

Wall Windows Analyses							
Purpose of analysis	Page	Figure	Height/cm	Width/cm	From Ceiling/cm	From Floor/cm	Direction
Base sample	20	14	150	120	40	110	East
Window height	21	15	200	120	30	20	East
Window width	22	16	150	200	40	110	East
Window direction	18	24	150	120	40	110	North
Window direction	18	24	150	120	40	110	West
Window direction	18	24	150	120	40	110	South
Ceiling Openings Analyses							
Purpose of analysis	Page	Figure	Length/cm	Width/cm	Type		
Base sample	25	19	200	200	Single-Floor Space		
Indirect opening	26	20	400	100	Multi-Floor Space		
Light Controller Analyses							
Purpose of analysis	Page	Figure	Type				
Flexible controller	29	23	Venetian Blind/ Dynamic				
Flexible controller	30	24	Translucent Curtain/ Dynamic				
Fixed controller	31	25	Overhang/ Static				
Fixed controller	33	27	Greenery/ Static				

In the first part I will analyze effects of different width and height of windows on daylight inside the room. The second part will focus on the influences of window's face direction and the third part will compare differences of natural light in terms of intensity and depth of penetration via different typology of aperture like wall openings and roof opening.

In all of the analyses, I have tried to express my own opinion about the atmosphere of each rendered room.

In first render and draft (Figure 14) the size of the windows is 120 cm width by 150 height and the window faces east. The size of the window compared to the floor area of the room is 15%. As it can be seen, the room is relatively bright with a visual access to the outside which covers the area of sky and horizon and provides the knowledge of time, climate and height. In my opinion the space is neutral, neither too bright and irritating nor very dark and cozy.

Figure 14 East window render and section

3.5.1. Window height

As the window becomes larger, the amount of light coming inside increased. The depth of penetration is also significant as it is well spread throughout all surfaces like facing wall and north adjoining wall.

The other crucial point is that there is a huge amount of reflected light from ceiling to the other points of the room. In design process, the amount of reflected light can be determined with the reflectivity and color of ceiling. In the second render and draft (Figure 15) the window height is changed to the 200 centimeters. In comparison with the figure 14, the room seems brighter in term of ambient light, meanwhile the pattern of direct sunlight covers larger area on the floor. Furthermore, I can assume that higher window provide deeper light as the opposite wall is brighter. Thus, the height of the window notably effects on intensity and depth of light penetration plus more disturbing direct sunlight. Moreover, the amount of transparency has been increased and it can be assumed that in figure 15 users can observe more events in the ground level.

All in all, I can feel more energy in atmosphere of this room due to more light and scenery.

Figure 15 Taller window render and draft

3.5.2. Window width

In the third render (Figure 16) I changed the width of the window from 120cm to 200cm. As it is clear; the outcome regards to the intensity of light is similar with figure 15 where I increased the height of the window. It means that a wider window causes more light in space, although it seems that penetration of light via a taller window is deeper than with a wider window.

It should be also mentioned that the pattern of direct sunlight becomes wider.

In my opinion the atmosphere of this room is similar to the figure 15 but I personally prefer the taller window because of more visibility of ground level. It have to be admitted that shorter windows provide more privacy, especially for the room on the ground floor.

Therefore the dimensions of a window can affect all technical issues like intensity, depth of penetration and privacy, meanwhile it changes the character of space (Figure 17).

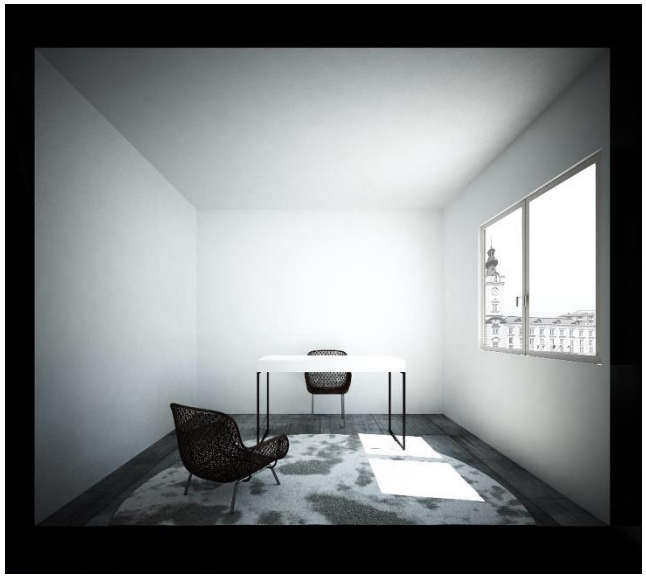


Figure 16 Wider window render

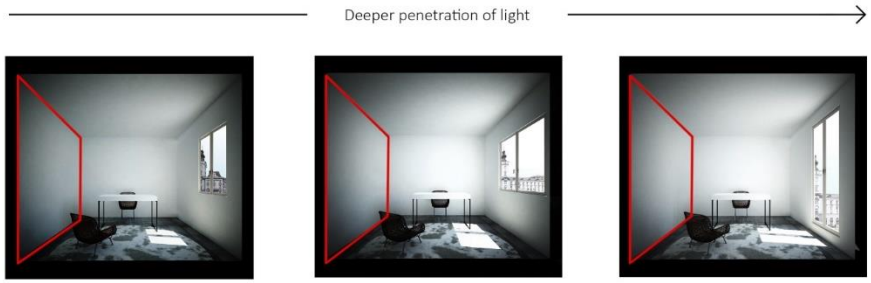


Figure 17 Influence of window size on the brightness and character of room

3.5.3. Window direction

In northern hemisphere, sunrise is somewhere between north and east and sunset is between north and west.

Therefore, we can assume that in the early morning of each day after sunrise till midday the eastern windows face direct sunlight and light can enter the building which influences on the amount of ambient light and atmosphere.

As it was mentioned before, the window in figures 14, 15 and 16 was facing east. Hence, in figure 18 I respectively changed it to the north, west and south from left to right in order to observe differences of light and atmosphere.

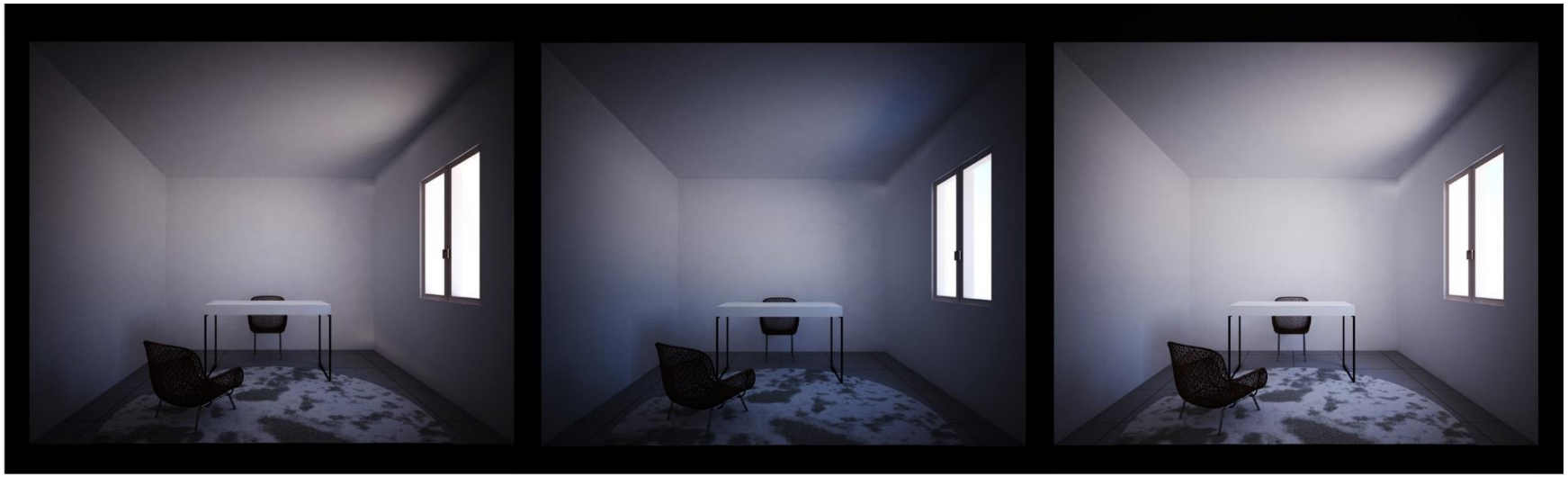
According to the figure 18 the renders for north and west illustrate that the intensity of light is remarkably decreased. It is worth mentioning that there is not any pattern of direct sunlight in the room.

The right render of figure 18 with the window towards south shows more light coming inside and the result is a brighter room. The main point regards to the direction is differences of intensity, penetration and the direct sunlight which are different due to motion of sun in the sky. It means that most likely, after midday the direct sunlight will enter through west window which might be similar condition observed to the first render in figure 14.

In summary, the images for different direction show that northern light tends to be softer and more uniform due to the fact that there will not be any direct sun light, meanwhile the light coming from south tends to be more intense and have more variation because of permanent presence of sun in south. Furthermore, for the east and west, the light can be smooth during the time that there is no direct sunlight, and more intense for the hours when the direct sun and skylight penetrate into the interior together.

The other viewpoint in differences between windows direction is the clear change in atmosphere. There is a drastic transformation in atmosphere due to different color of light in rooms with north, west and south windows in comparison with the east one.

The ambient color of room with window toward east is close to the red and yellow spectrum, while in other renders the light is closer to the blue color. The main reason might be different amount of direct and reflected light from sky coming through different directions.



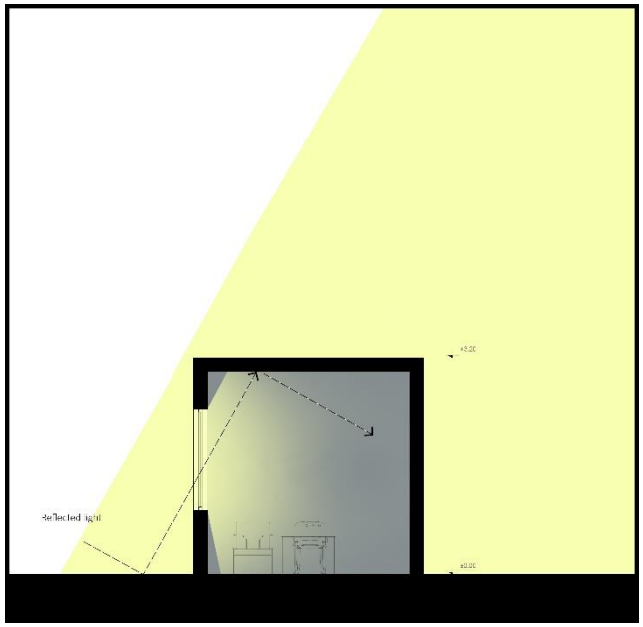


Figure 18 Different direction windows renders and section

3.5.4. Roof openings and wall windows

Roof openings are types of devices for picking up high quantity of light with minimum sized opening. The light which falls on the horizontal surfaces like roof is more than that which strikes the vertical surfaces like walls. (Evans, Daylight in Architecture, 1981, p. 64)

In figure 19 I omitted the window and created a ceiling opening of 200cm by 200cm on the center of room to analyze only quality of light coming inside through this opening. The result is a bright room, with deep penetration of light interrupted by a big pattern of direct sunlight on the west wall. This pattern would be moveable through a day because of the solar path from south-east to the south-west. And it might be vanished during early hours of morning after sunrise and end of the day before sunset due to low height and steep angle of sun in sky.

To me, the room is bland and boring due to lack of scenery, it is bright as much as the room with the medium size window to the east, but it reminds me of cell-like spaces.

Figure 19 Ceiling opening and direct sun light render and section

One of the important advantage of roof openings is that they can even be used to bring light into lower floor of multistory buildings. In figure 20, I added an extra floor with the same ceiling height above the analyzed room and expanded the room 1m more to the west to created a patio being opened along its ceiling. The concrete wall on the west of the room was also replaced with a glassy one. The result is a fairly bright room. There is not any pattern of direct sunlight and smooth transition of light can be seen.

The negative point of this method is that there will not be any visual connection between inside and outside, though in some cases there can be a potential for creating fairly bright room with maximum amount of privacy.

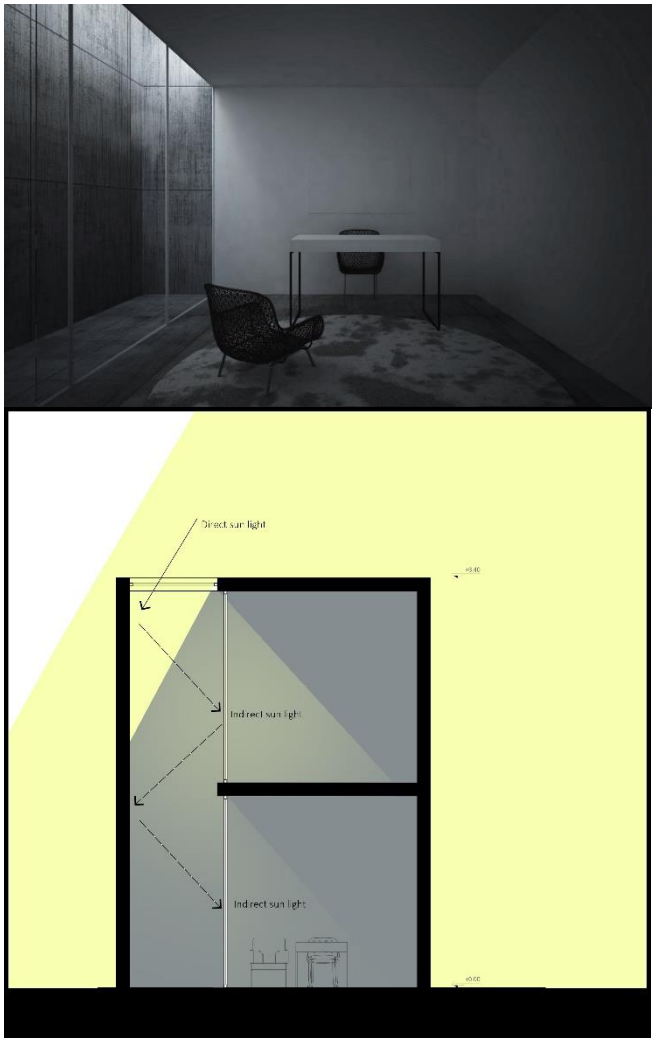


Figure 20 multi-store Ceiling opening and reflected day light render and draft

For better understanding of differences between direct and indirect sky light and its effects on the atmosphere of environment, the related renders can be compared together. (Figure 21)

Figure 21 Differences of single and multistore ceiling opening

3.6. Daylight controller

Daylight controlling devices are variable. Different methods can be used to control where it is needed to eliminate brightness. The main point which can be effective on design is that some of these controls are dynamic (they are moveable) and some others are static (permanent architectural elements).

With the dynamic controllers we will allow users to control light in respond to their requirements. However, the static controls are not responsive, but they also can be dedicated for more efficiency and providing different atmosphere in term of lighting.

In following, I will try to show you similar analyzes through light virtual simulating to compare impact of light control methods.

Figure 22 Dynamic light controller

3.6.1. Dynamic controllers

One of the most practical devices for daylight control is venetian blinds. They can be added to the aperture to exclude direct sunlight and reflect it to the ceiling to spread it over interior space, while still it allows us enjoy exterior view. They can also be titled to be completely closed in order to block all the light and the visual connection between inside and outside.

In figure 23 I attached a blind to the window to control the light. As it can be compared with the figure 14 (the first render), the result is a room with smoother incoming light. The view is limited but still there is a connection.

The Venetian blinds components were horizontal and it causes reflection of direct sunlight to the ceiling. Hence, there is not any pattern of light on the floor.

Figure 23 Venetian blind render and section

Translucent curtain is another dynamic device for controlling daylight and view. They transmit light inside and do not permit a view. The main characteristic of translucent might be diffusing the light to spread it over a wide angle.

The main difference between blinds and translucent controllers is the difference between volumes of privacy. Thanks to the blinds, the users can regulate their environment for being open or closed to the outside world, but translucent curtains do not have a wide variety of light and view control as blinds have in a certain moment.

In terms of the atmosphere, in my opinion the room with blinds is more alive than the one with translucent curtain due to outdoor visibility. It also shows more dynamism of sun movement in sky because of the direct light coming through its components. (Figure 24)

The translucent materials make more uniformed light in interior and it could make the room more depressing and gloomy.

Figure 24 Translucent curtain render and section

3.6.2. Static controllers

Building's overhangs can be used for controlling daylight and protect people from the rain. They reduce intensity of light via making shadows on openings and based on the angle of sun, they can block direct sunlight, although they collect reflection of light from outside floor and transmit it to the inside.

In figure 25 I modelled 120cm wide overhangs along the east wall and it is clear that it reduced light intensity and there is no direct sunlight coming inside, although the visibility remains in sensible amount.

Figure 25 Overhang render and section

Figure 26 Effect of overhang on ambient light and atmosphere of room

In figure 26, the intensity of ambient light and emerged atmosphere in room with overhang (Middle render) look like those in west window room (Right render). It means that we can use dynamic devices such as canopy, porches, etc. to control daylight and create intended atmosphere.

One of the creative solutions for controlling intensity of day light and preventing entrance of direct sun light is to use greenery close to the openings. Vegetation can provide natural attractive scenery for users inside, moreover motion of plants components project dynamism of light inside which might be creating more interesting environment (figure 27).

Figure 27 Greenery for light controlling render and section

Essentially, in these analyses it is assumed that architectural elements related to the natural light have significant effects on all charechtristics of light such as depth of penetration, quentity, quality and pattern of direct sunlight inside spaces, and subsequently these parameters can generate wide range of atmosphere.

It is valueable to mention that in each model for simulating, I only analyzed one of the lighting techniques for more clear comprehension of each separate methods. In real constructed project, we usualy merge them together based on different demands of spaces for lighting.

From a personal perspective, this is similar to creat a piece of music when the composer uses combination of different notes to produce ups and downs. In this regard, all of the architectural elements such as color, light, tempreature, texture and privacy are the environmental notes in the hand of architects to provide most suitable environments for occupants.

Figure 28 T space, Steven Holl

Daylight in Persian Traditional Architecture

4. Daylight in Persian traditional architecture

Light has a long history in Iranian beliefs. Before advent of Islam in Iran, religions such as Zoroastrianism, Manichaeism and Mithraism have used light parables to enlighten their beliefs. In the Islamic era, the light is the manifestation of God's existence and is therefore considered holy and respected. Thus, the axis of using light had been spiritual aspects and the main purpose was movement from darkness to the brightness. (Hanachi, 2015, p. 40)

Figure 29 Fire temple, Isfahan, Iran

Through history, architects have recognized the importance of lighting in architecture and have invented smart designs for using light in their construction. Iranian architects utilize light in various forms, and the innovations have been applied to the Iranian traditional architecture over long course of time to take advantages of natural light.

The use of light in Iran, due to different climates, requires different encounters. In dry and warm regions, light intensity has forced the traditional architects to control the light. This has been followed by limiting the size of the openings, creating lattice and porcelain decorations with tiles and bricks. But in contrast, in north part of country with the humid and temperate climate they increased the dimensions of the windows because of modest and lower intensity of light. These architectural practices targeted other concepts like ventilation and humidity issues simultaneously (Khakpour, Ansari, & Taherian, 2010, p. 34).

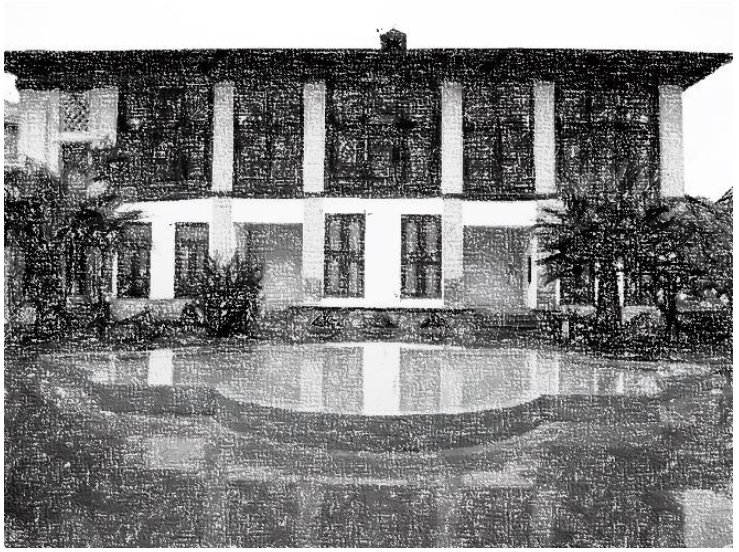


Figure 30 Kolbadi House, Sari, Iran

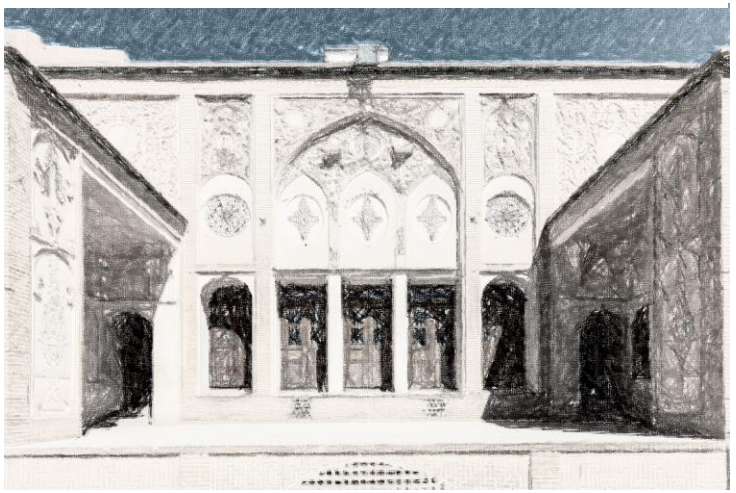


Figure 31 Boroujerdi House, Kashan, Iran

To the eighteenth and nineteenth centuries in Iran, determining the location and orientation of the cities were based on the intensity and direction of the sun (Hanachi, 2015, p. 42). The light has been also used to diversify urban space via creating architectural components which will be discussed more in the following.

The concept of using light in Iranian architecture has evolved over the years and one of the efforts was bringing dynamism to the space and it has influenced on building's form with its aesthetics and spirituality. Persian architects with their ideological and applied view to the light created different kind of atmosphere based on different issues such as climate, functionality and expression of environment. (Hanachi, 2015 pp. 43-45)

In temple's architecture like mosques, architects tried to amplify symbolic aspects of light in order to emphasis on presence of god, where the basic composition of dome on top of the square plan and light flow from above created clerical atmosphere. (Hanachi, 2015, p. 43)

In Bazar, the rays of light penetrated in to the interior guided people to identify the time and recognize their orientation like a navigator due to the lack of connection with outside. (Ahani, 2011, p. 29)

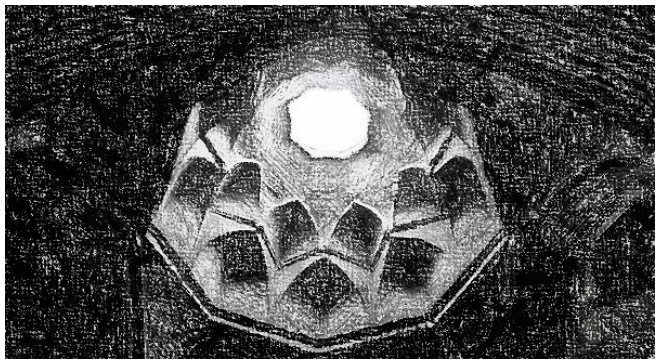


Figure 32 Dome opening (Rouzan) Nezam al molk mosque, Isfahan, Iran

Figure 33 Abbas Bazar, Tehran, Iran

Architects, in spaces with more privacy like public bath, installed semi-transparent materials such as thin polished marble tiles in eastern and western walls to able users for observing movement of sun between sunset and sunrise, and blocking visual connection from outside to the inside. (Hanachi, 2015, p. 44)

In traditional school the natural light was crucial. Architects tried to control intensity of natural light through Mogharnas, Karbandi, Rouzan and shadowing to create peaceful classroom for expanding student's learning ability. Usually, schools were constructed with the idea of central courtyard with the width more than height of surrounding walls in order to achieve enough penetration of light. (Hanachi, 2015, p. 44)

Mogharnas and Karbandi were structural elements using to share loads in traditional architecture. Apart from its structural and decorative roles, the architects created the hole between Mogharnas vertical elements toward different direction which provides income lighting in different direction as well. (Moradi, Mahdavipour, & Ghasemi, 2013, p. 10)

Figure 34 Dome opening (Rouzan), Traditional Public Bath, Iran

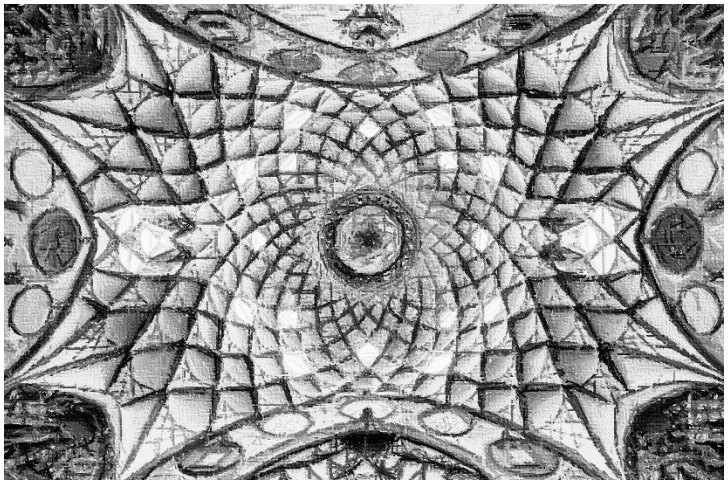


Figure 35 Mogharnas and Karbandi,

In houses, lighting has not been monotonous. By creating the contrast in lighting, there was a feeling of relaxation for inhabitants. The bright courtyard and the arrangement of half-open and closed spaces around it, helped occupants to control the amount of light entering the spaces. The brightness of surrounding space's interior, including the living room and bedrooms were provided through colored glass windows that allowed the users to be not seen within this space, but they can easily enjoy the view from inside to the courtyard. Hence, in Iranian private houses, dark interiors and bright central courtyard have been divided with a semi private and semi-bright space like Porch (Ravagh) and it was the concept of light sequence from brightness for open spaces to the darkness for interiors. (Hanachi, 2015, pp. 43-45)

Figure 36 Tabatabaie House, Kashan, Iran

Figure 37 Tabatabaie House, Kashan, Iran

Iranian Day Light Architectural Elements				
Light Controller				
NO	Name	Description	Page	Figure
1	Ravagh (Porch)	An external semi-open space between interiors and outdoors	42	39
2	Tabeshband (Canopy)	A projected horizontal partition from façade for hanging curtains and shadowing on openings	43	41
3	Sabat	A kind of arch to cover the routs and shadowing on public spaces	44	42
Openings				
1	Shabak	Bricks or mosaics hollow partition to cover openings for light control	45	45
2	Orosi	Wall opening with colorful and geometric glass tile	46	46
3	Jamkhaneh	A vertical extruded element as an opening on the top of domes	47	48
4	Karbandi and Mogharnas	A decorative and structural system with the openings between its elements for lighting		
5	Rouzan	Circle shape ceiling opening at the top of dome		

4.1. Traditional daylight elements

Static controllers were porch, canopy and sabat. Porch (Ravagh) is a roofed structure which is blocked at least on one side. The main function of porch is protecting users from direct sun light and rain. In regions where the intensity and heat of sun is high, porch reduced intensity of light, emitted indirect and moderated light, to the interior. (Moradi et al., 2013, p. 6)

Figure 38 Kabud Mosque, Tabriz, Iran

Figure 39 Ravagh render and section

Canopy (Tabeshband) is a 6cm or more width partition projected from walls around windows in order to create shadows. They can be constructed vertical and horizontal. The main function of Tabeshband was to create shadow on opening. (Moradi et al., 2013, p. 6)

Figure 40 Ali Qapu, Isfahan, Iran

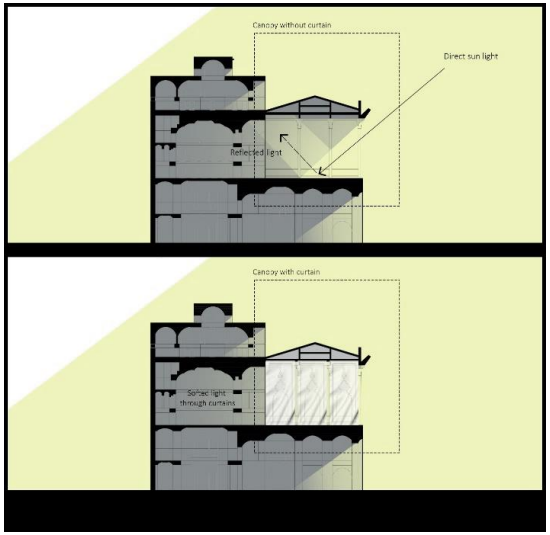


Figure 41 Tabeshband section

Sabat was a covered alley in both tropical and cold cities in order to create rhythm of shadows and light in public spaces. The differences of temperature in shadowed and bright spaces causes air circulation and coolness of path. (Moradi et al., 2013, p. 7)

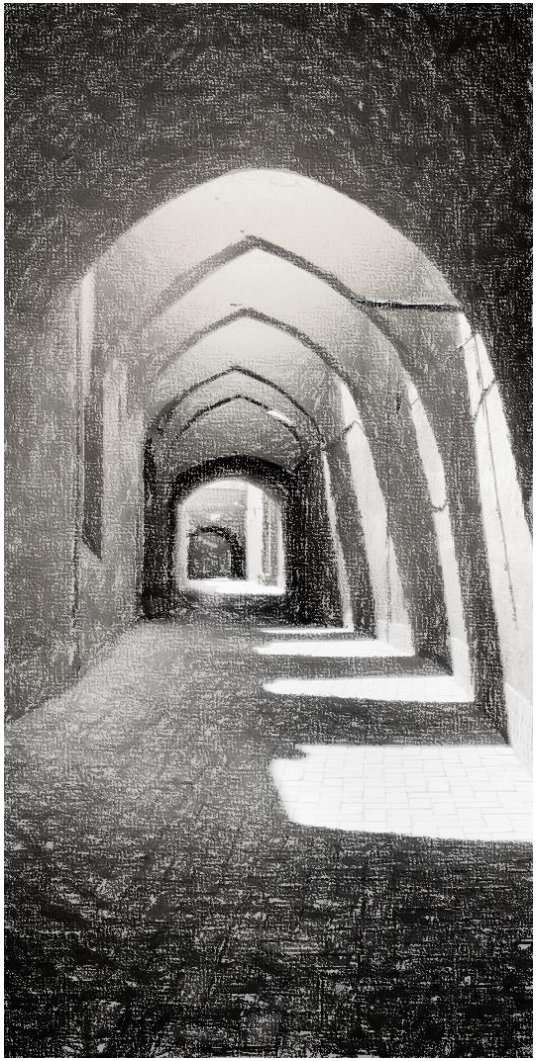


Figure 43 Sabat, Yazd, Iran

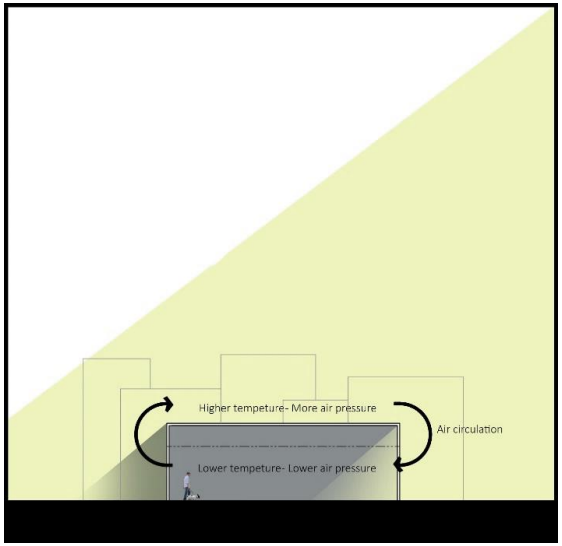


Figure 42 Sabat section

Apertures have been very diverse in Iranian architecture, and each of them has different functions with different names.

Wide range of climate in Iran in terms of daylight, wind, rain, storms and in addition the religious beliefs about privacy led architects to use protector elements in opening design. In this way, Shabak was a porous thin shell that is usually made of bricks or tiles reducing intensity of light. Moreover, reflected light from edge of holes on it caused softer light coming inside. The other function of Shabak has been reduction of visibility from outside to the interior. (Moradi et al., 2013, p. 8)

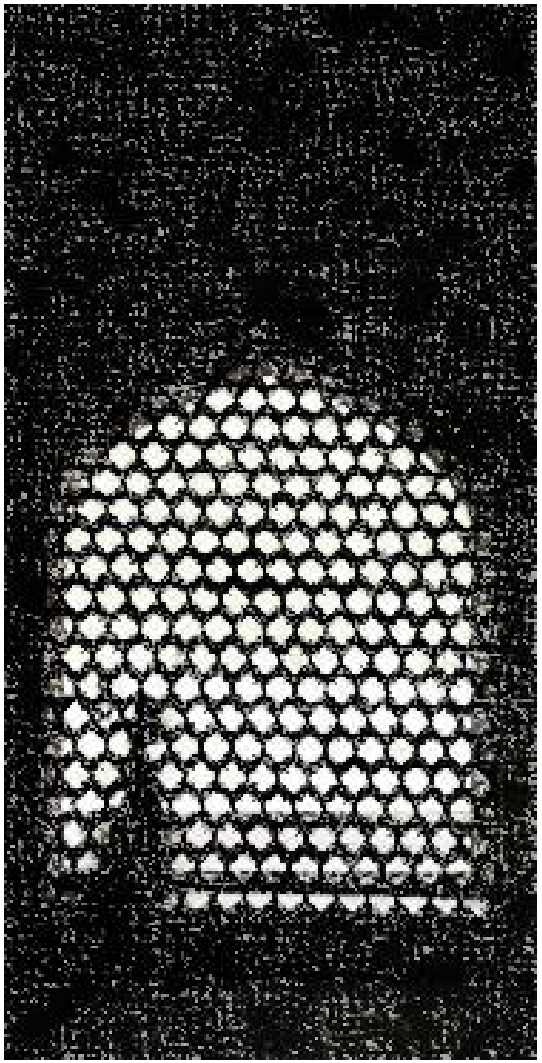


Figure 44 Shabak

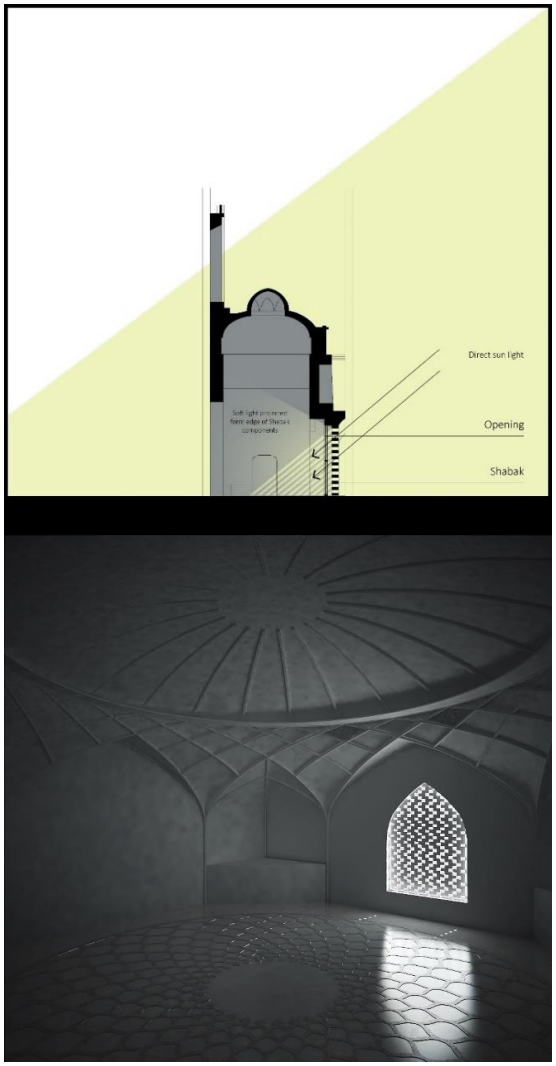


Figure 45 Shabak Render and section

The design of windows was innovative. Orosi is a kind of window which moves up and down instead of rotating around a vertical or horizontal axis. Orosis were decorated with colored glasses and the main reasons have been reducing sun light and heat, privacy of interior, providing soft light for inside and decoration of façade. Moreover, occupants could completely open the Orosis in order to merge outside and inside and have a wider spaces plus more air circulation during the night in warm seasons. The colored glass also reduced intensity of light and prevented eyes getting tired. They also created eye-catching atmosphere and unique character for spaces. (Moradi et al., 2013, p. 9)

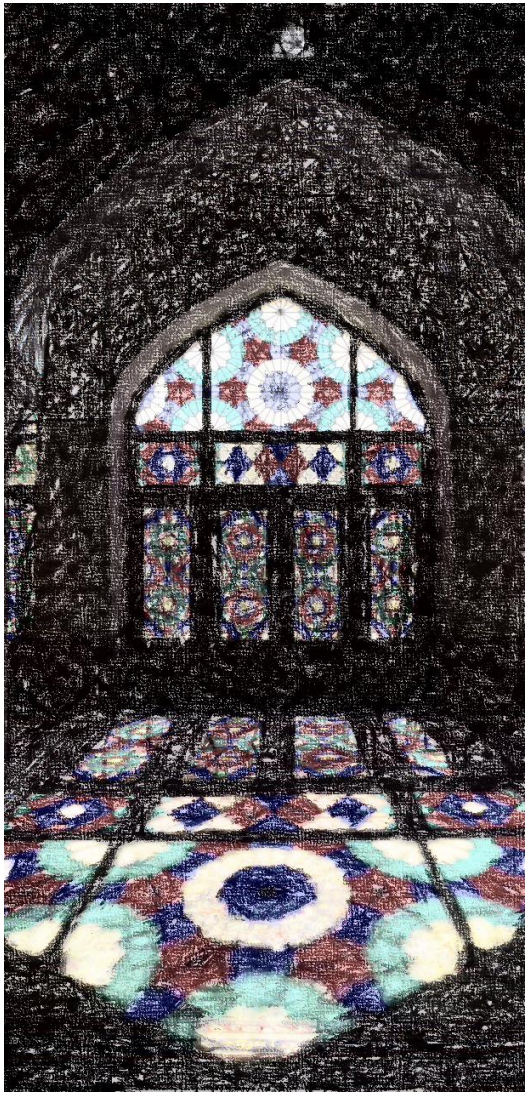


Figure 47 Nasir Al Molk Mosque, Shiraz, Iran

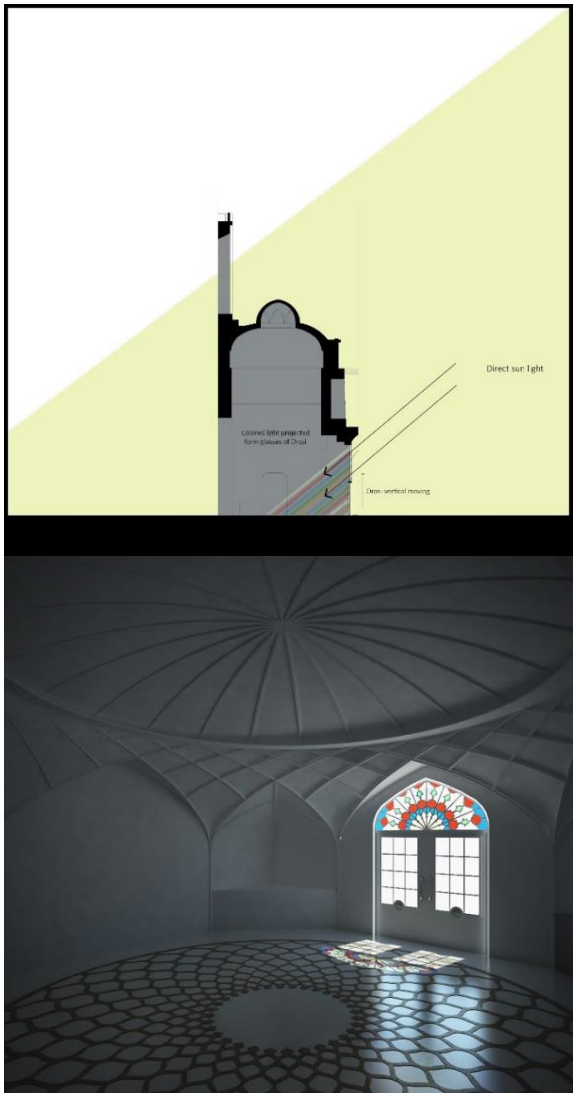


Figure 46 Orosi render and section

At the highest part of the dome, there was a spot for lighting. In order to control the direct sunlight through this hole, Iranian architects invented a potted light-emitter which were extruded from dome and was named **Jamkhaneh**. This architectural element for lighting was covered with a thick glass being removable for summer to provide more air circulation. Generally Jamkhaneh had been used for public spaces where a spacious area was covered with a huge dome like mosque, caravansary, schools and public bath. Jamkhaneh not only blocked direct sunlight but also they were covered with glossy materials inside in order to direct more reflected light from outside to the interior. (Moradi et al., 2013, p. 9)

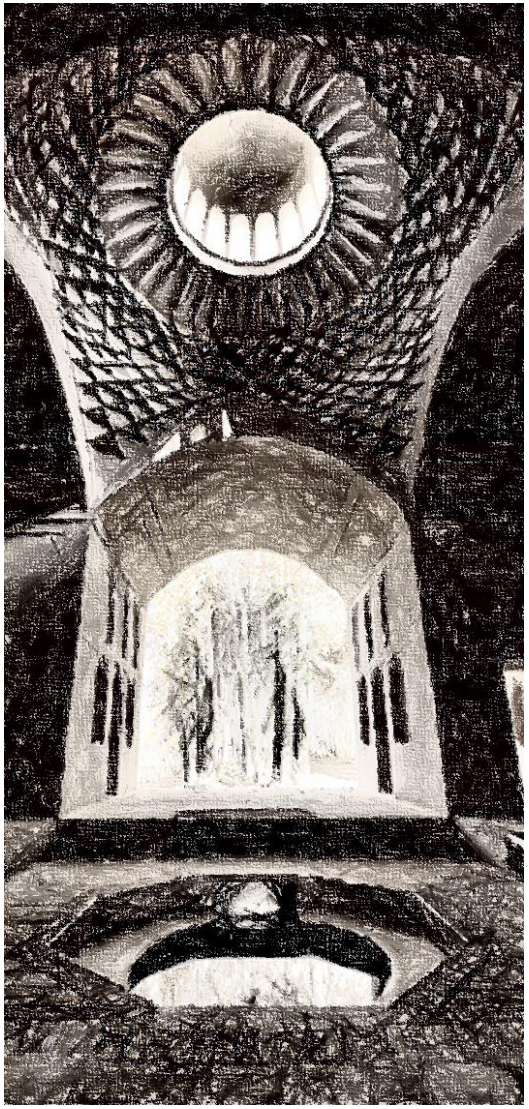


Figure 49 Isfahan Atigh mosque, Jamkhaneh

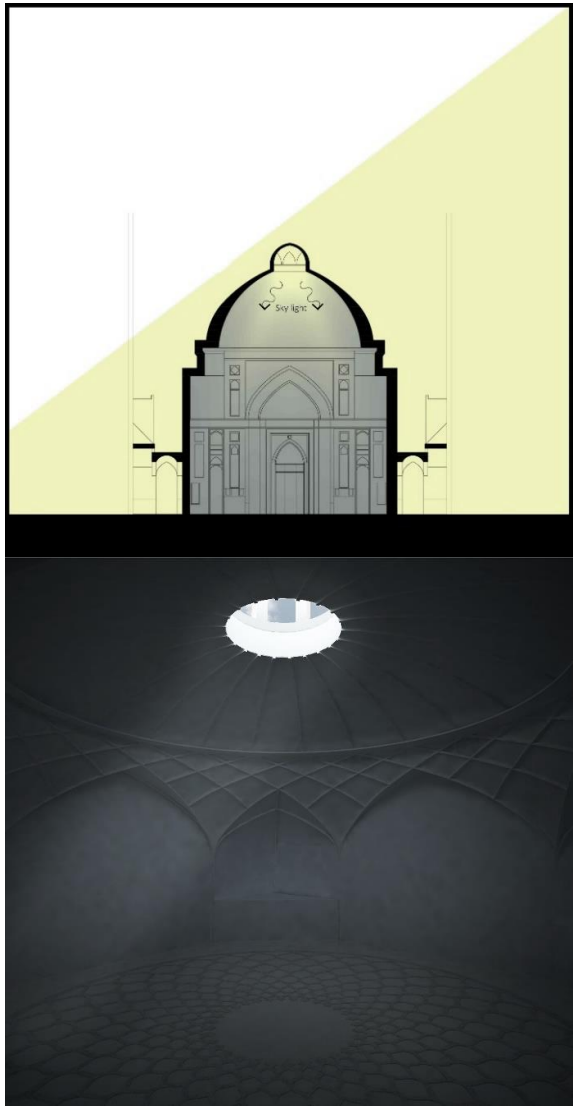


Figure 48 Jamkhaneh render and section

4.2. Case studies of Natural light in Iranian Architecture

In following, the paper will focus on effects of light and architectural elements related to the light in form of architecture through analyzing historical case studies.

The main sources of this part is my courses in bachelor degree such as “Historical Iranian Architecture” and “Islamic Architecture”. The lectures of fore-mentioned courses were provided by prof. Sobouti and Reza zadeh in Azad University.

As already mentioned, Iranian architecture is based on different climates, which has led to variation in form and elements of illumination. Moreover based on the fact that Tehran is located in a warm and dry climate, in the following, I will be come up with a summary on how all of those illuminating lighting which has been discussed above acted in architecture of this climate.

The warm and dry summer weather, the cold and dry winter, the lack of rain, winds full of dust, and the difference in temperature in the day and night due to lack of humidity and long distance from the sea, all of a number of warm and dry climates features in most regions of Iran. Thus, because of these reasons dominant of houses and public buildings in this climate have had central courtyard for more air circulation.

Figure 50, Google earth captured top view, Yazd, Iran

The four season inward houses were prominent example of buildings with a central courtyard. Here, the north side wall was in front of the mild winter sun light and had more heat which were used during winter. Meanwhile, south side of the courtyard which was back to the sun and shaded were used for summer.

For instance, The Boroujerdi house located in Kashan (Warm and dry climate) is a clear architectural slogan of this typology, where the North side spaces were used during winter and south side was for summer. The other point is that the South part was taller than north for more shading on courtyard.

Figure 51 Google earth captured top view, Boroujerdiha House, Kashan, Iran

Figure 52 Boroujerdlha House, South side of courtyard

Figure 53 Boroujerdlha House, North side of courtyard

In addition to the climatic conditions, issues of religious beliefs have also been significant in the formation of inward houses. In these cases there had not been any openings on outside walls while inside elevations were full of windows in different size faced to the central courtyard. In order to invite more light, Iranian architects had chosen bigger windows to bring more light into the south. With the idea of using colored glasses in different sizes, they have created a beautiful colorful illuminating in the spaces behind the windows.

Figure 54 Boroujerdiha House, Section of light penetration

In term of spatial sequence, there are court yard as an open space, porch as a semi closed and living rooms behind the porch as a most private and closed space. This architectural discipline provided a clear sequences of light and privacy in each space which could be used for different function. In my point of view, as an Iranian, this is also the formation of architecture based on culture and climate. People could enjoy their private garden in heart of desert without any disturbance of worrying about their religious belief in regards to privacy.

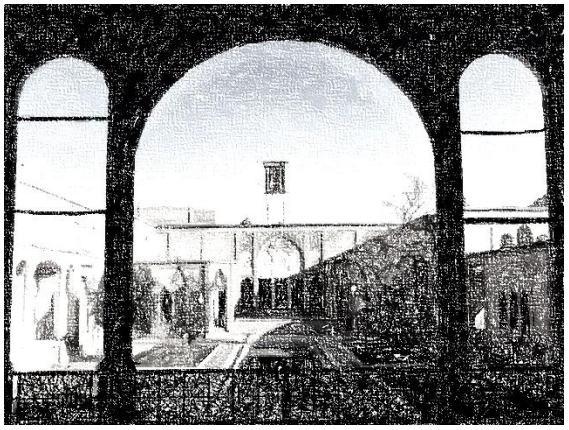


Figure 55 view from porch to north side of courtyard

Figure Boroujerdiha House, interior

The use of different day lighting techniques which were discussed in the beginning of this chapter, was also based on the function and demands of users.

In most of Iranian houses, there was a space reserved for arrival of guest and members of house which was called “Hashti”. Ceiling opening like “Rouzan” was used in spaces such as “Hahsti” and kitchen which were most private part of house and they were opened to the sky creating possibility of light from sunrise to sunset.

Figure 56 Boroujerdiha House, Hashti (Entrance space) with Rouzan at the top of Dome

The basements were built one meter above the courtyard, because of the need for light, and it was illuminated through “Shabak”.

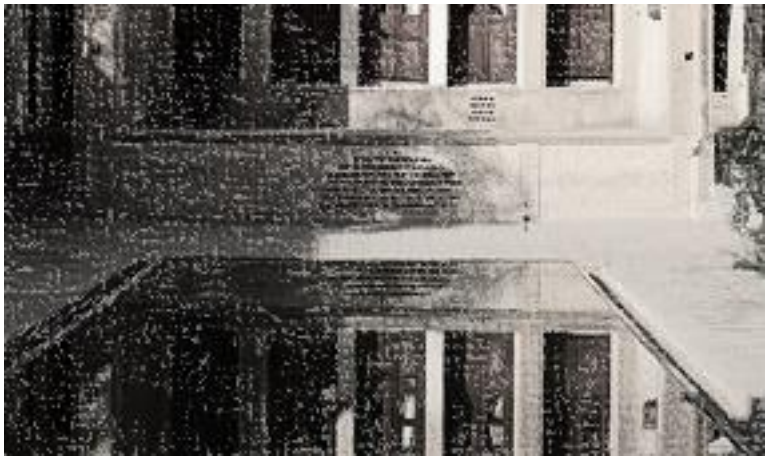


Figure 57 Shabak for basement lighting

In pursuing of better understanding how the climate (light condition and weather) and culture have influenced on architecture, we can have a short glance of another typology based on moderate climate in north part of Iran where the houses had been outward.

The moderate and humid weather, dominant rainy days per year and heavy greener are the main climatic features in north of Iran. Regard to culture it is worth mentioning that Iranian living in northern part of the country is more open-minded, in terms of religious believes, than their country-mates' living in south and central parts.

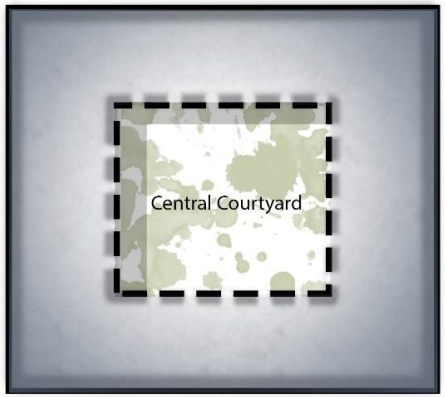
Therefore, due to fore-mentioned reasons dominant of houses and other type of buildings in this climate have been opened to the urban public spaces without any central yard. As it can be seen in top view of Anzali port, not only the building does not have central yard but also they transform urban public spaces to the semi-private open spaces and it means more communication between inside and outside.

Figure 58 Google earth captured top view, Anzali, North of Iran

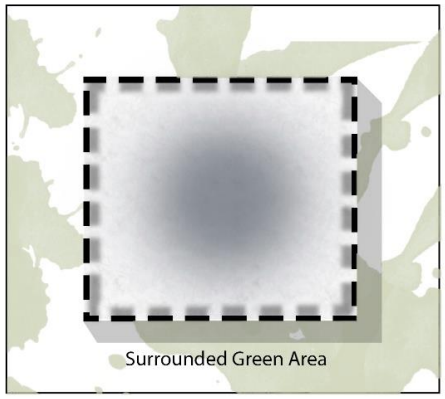
In this climate, the buildings have wide opening to the outside in all of direction to have more air circulation inside and more light. In Fact, the moderate climate in Iran is located on higher latitude and the elevation of sun is lower than warm and dry climate in central part.

In this region, almost all of the buildings do not have static light controllers like porch or canopy and windows freely open to the semi-public area which has been based on both climate and culture features.

Figure 59 Traditional House, Sari, Iran, Bigger size of Opening



Typology of warm and dry climate architecture in Iran
More Private and Cozy spaces



Typology of moderate climate architecture in Iran
More opened and connected interior to the outside

Figure 60 Typology of Architecture in North and Central part of Iran

Case studies of Daylight in Contemporary Architecture

5. Case studies of daylight in contemporary architecture

Based on all the analyses in the previous chapter related to different daylighting techniques and architectural elements, the main approach is to use aperture in buildings to cover both lighting demands (technical) and feeling necessities (atmospheric).

In this chapter I will try to study the emergence of all those lighting methods in three contemporary projects done by contemporary architects.

Regards to the logic behind the choice of projects for study, it is worth mentioning that I tried to have all different expression of spaces, like exciting and alive, neutral and cozy atmosphere in separate projects.

For this purpose, the first project is a Healthy Life Center with bright and merged interiors with outside space.

The second project is a Health municipal clinic which has, in my opinion, very neutral spaces in terms of both lighting and privacy and the characters of interiors are either not cheerful or cozy. The third projects is greatly an isolated and cozy house with the most expression of quietness.

5.1. Sk Yee healthy life center

The SK Yee Healthy Life Centre is a simple but worthwhile project which has been designed by Ronald Lu & Partners (RLP). The project includes the interior spaces, for a rooftop addition with the light construction of a 380 sq.m structure in Hong Kong. (Archdaily, 2015c)

At first glance, the project seems to be a lean and green structure that provides wide range of environments for healing process, and yet acts as a garden, home and playground for patients. (Archdaily, 2015c)

The project is a quiet rooftop that offers calmness and serenity to the patients throughout free stress environment which is provided by daylight and nature. The main concept of project is also modest, yet meaningful and embodies a number of positive spaces for healing process. The consultation rooms are surrounded with a semi-private negative spaces which is emerged as a tiny garden. Hence, this poetic rhythm of roofed and open-green spaces creates a constant interplay between interior and outside which draws natural light and fresh air to the structure. (Archdaily, 2015c)

Figure 61 Sk Yee Center Plan

In my opinion, due to the crossing over and spread of interiors through the roof garden, the center is 100 percent naturally lit and ventilated which creates a place of comfort, and respect for users. The point is that openings are in different directions and this provides different atmosphere for separate rooms during the day time.

Figure 63 Adult consulting room

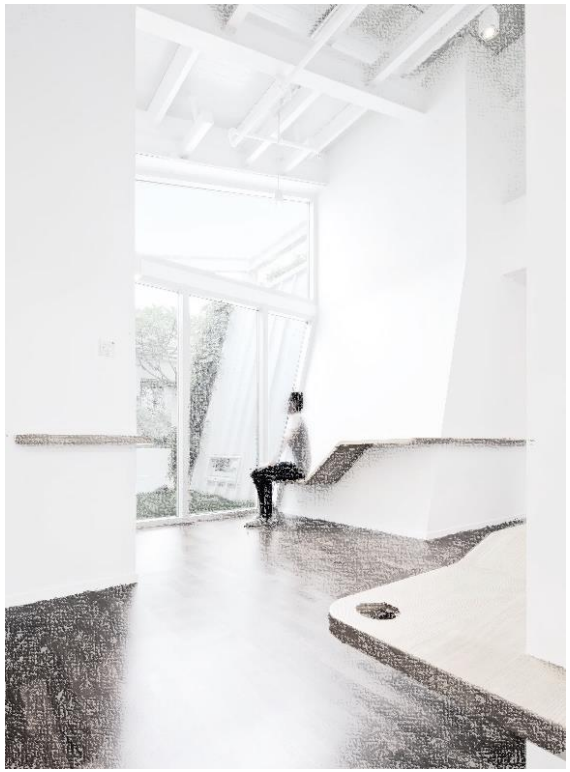


Figure 62 interior space

Adult consulting room with couple of wide openings toward semi-private garden contains adequate privacy and add freshness to the healing environment.

As it was discussed before, the view is an essence that is inseparably merged with the openings and quiddity of scenery in terms of visual beauty, calmness and light can significantly effects on quality of space. In this project greenery as a natural beauty is prevalent throughout the center.

This external landscape integrates seamlessly and harmoniously with the interiors, create a cheerful environment for the patients. The light is also filtered and moderated through greenery to penetrate with minimum disturbances like direct sun beam and glare.

Figure 64 consulting room openings toward greenery

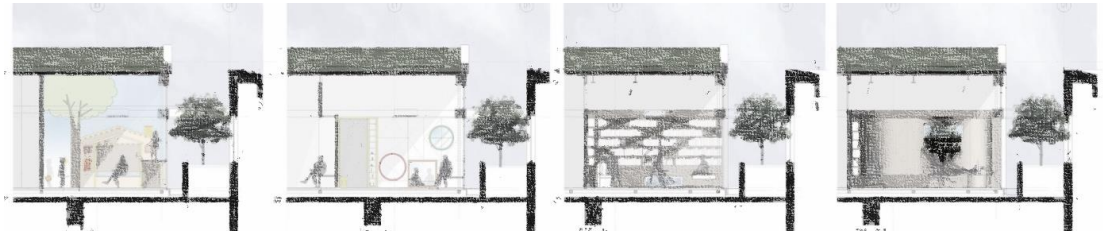


Figure 65 Different spaces toward semi-private gardens

With plenty of natural ventilation and daylight, the center provides a unique and fun counselling environment for children (Archdaily, 2015c).

The wide openings toward different directions with an interplay between interior and exteriors creates an exciting atmosphere for children, while they can be observed by their parents. It means free stress atmosphere for both children and adults.

Figure 66 visual connection between interiors and outdoor playgrounds

In technical point, almost all of the openings are from ceiling to the floor and it can prove opportunity for users to open them entirely and add the quality of gardens to the interior spaces during the day. It can also result more air ventilation and freshness to the environment.

All in all, the significant point of this project is that all layers of space in terms of inside and outside are merged together. The calmness and natural beauty of the gardens remind the users that life is on the stream. And as it is clear on the images, the center, with the lit room and extra greenery, has full of positive energy and excitement. It is worth to mention that although designers of the project tried to remove all barriers between inside and outside, they considered privacy and discipline as main keys of spaces functionality.

It is worth noting that, this project seems like those outward houses in north of Iran analyzed in the chapter of Iranian traditional architecture. In both projects the interaction of interior and outside is in highest level.

Figure 68 Ceilling to floor opening

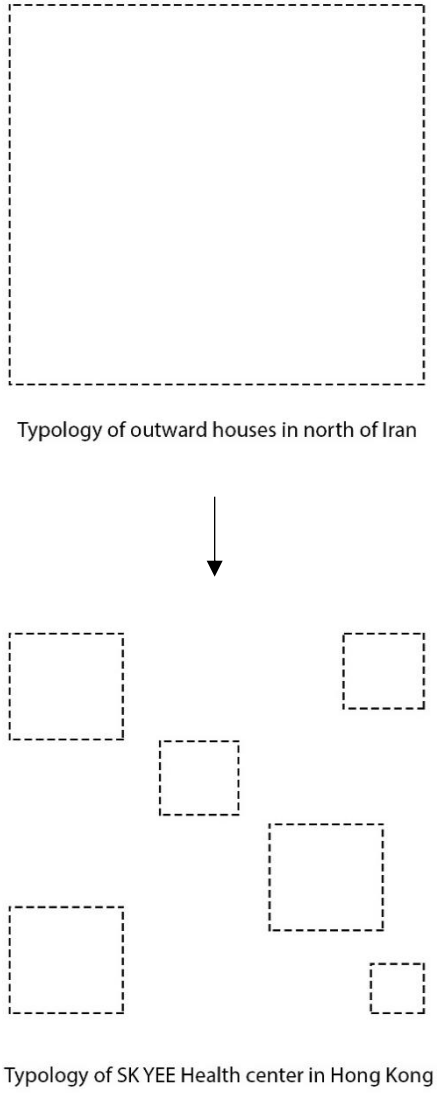


Figure 67 Different kinds of outward architecture typology

5.2. Health municipal clinic

Health municipal clinic is a local health center located in Void-Vacon commune in North east of France. The architects of project were Christophe Aubertin and Benoît Sindt and has been finished in 2014. (Archdaily, 2015b)

As it was explained by the architects that the site of building is located in a district surrounded by Gymnasium, The GITEM shopping center and a residential complex built in 1980s which means a crowded and high pedestrian traffic area. The architectural concept related to the location of building proposed a horizontal building having a dialogues with a meadow field. (Archdaily, 2015b)

The main concept of building shape were two criteria: to have maximum opening towards the south in order to have maximum amount of natural light during day and also to protect occupants from disturbing noises of N4 highway in the north (Image-36). The second issue of project were to create an intimate and secure atmosphere for offering clinical premises. In this way, the architects' solution was to use indirect openings with wood cladding, instead of frontal ones that cause direct view from pedestrian circulation outside. (Archdaily, 2015b)

Figure 69 Google earth Captured top view, Void- Vcon, France

Moreover, from the perspective of project's designers natural material are privileged where wood cladding covers outer envelope entirely, meanwhile they used stone for interior spaces to achieve reassuring serenity. (Archdaily, 2015b)

Figure 71 Opening with wooden cladding

Figure 70 intimate interiors with natural light and privacy

In my opinion, the striped wooden envelope animates a dance of shadows and light in interiors which captures beauty of natural dynamism. It also gives the users an adequate information about time, climate and activities outside which are all important for well-mood. The most significant and inspiring feature of project is bright interiors with high rate of privacy where the people inside can also enjoy natural scenery outside. These all provide peace and comfort without stress for users. Moreover, it would be in harmony with the building functions which needs quiteness to help technician for focusing on their sensitive careers.

Figure 72 Interior Spaces

Left to right, the first picture is Waiting hall with a comfortable atmosphere for relaxing and reducing anxiety before call to visit physician, and second and third pictures are central hallway clerestories.

Interior spaces divided into two wings within a long central corridor. The rooms in both sides are equipped with the wall openings, while in the central hallway which is enclosed by the other spaces, the natural light comes from apertures on the roof which towards south. Furthermore, the architects in some parts of building such as the entrances and the coffee shop provided wide openings without interference of wooden envelope. This creates more exciting atmosphere for inviting people come inside and enjoy their time with large view of outside and undoubtedly more light.

But in comparison to this, in some other spaces such as nursing rooms with more demands of discipline and quietness, the apertures moved up and became clerestories which generously capture south light.

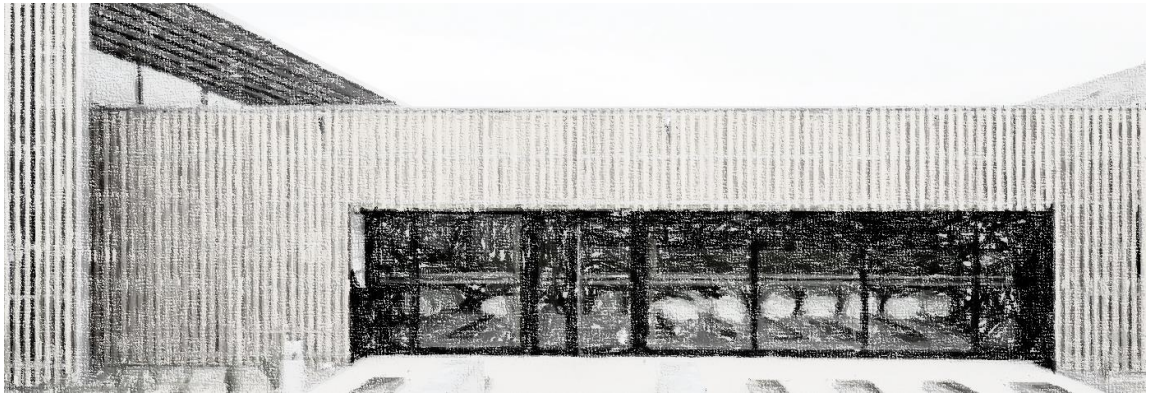


Figure 74 Cafe and wider openings

Figure 73 Nursing room with a clerestory

In this project, the frequency of the differences of light and views are adjusted with the function and requirements of each space which make them most suitable for users.

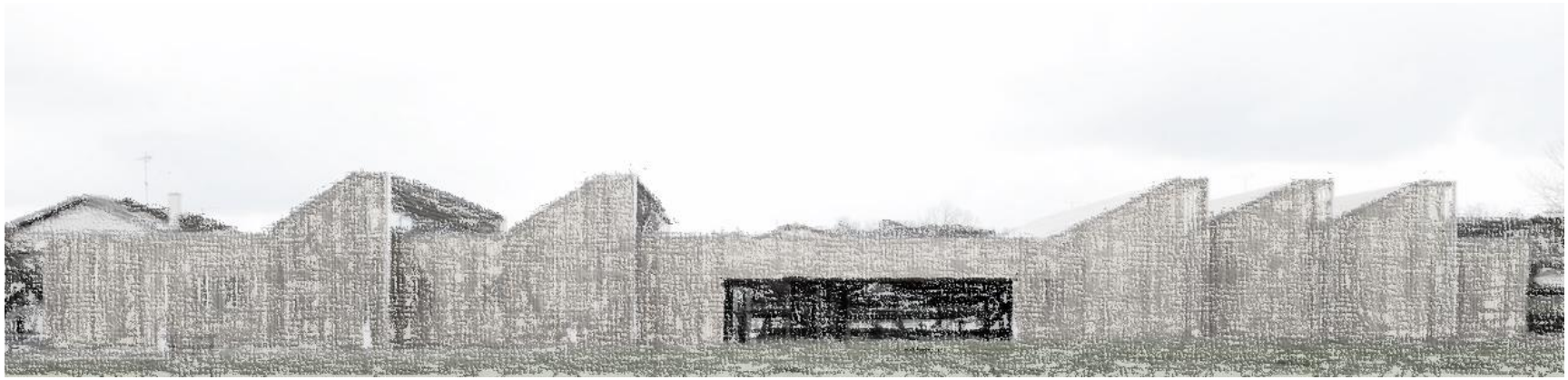


Figure 75 Health municipal clinic, France/ west elevation

Different types of openings with different volumes of controls created wide range of atmosphere through building.

5.3. House of silence

This is an architecture that can be supposed with its name as a place for relaxation, meditation and peace where occupants can enjoy their life without all the noise, traffic and bustle. The project has been done by Japanese architects Takumi Ota, Kei Nakajima in Japan (Archdaily, 2013).

Based on images of project it can be supposed that the main request of clients was to have an environment which has not been influenced by the world outside. Therefore, the result is a house that has not got many windows and been enveloped by the thick walls.

Figure 76 House of Silence, Japan

The architectural solution for users' appeal was to create couple of inner courtyard which have been cut off from outside environment and yet allows the light come inside and show variety of expression as the light changes through day time. (Archdaily, 2013)

The architects tried to minimize the connection of interior spaces and outside environment, while the interiors are embraced by natural light, fresh air and accessibility of information about the time and weather condition.

Figure 77 View from courtyard to the interiors

In the first floor, almost all of the interiors are illuminated by windows toward the courtyards which provided soft diffused light. The atmosphere of rooms in this level are cozy, warm and intimate.

All the windows which are toward outside, come smaller and are in depth of in comparison with those which are between interiors.

Figure 78 opening toward courtyard

Figure 79 openings toward outside

In the second floor, there are ceiling openings which collect the light from sky and provide different atmosphere than first floor spaces.

Figure 80 Interior spaces, Second floor

Figure 81 Interior spaces, Second floor

At the end, in my opinion house of silence is a place that gives you experience of going through variety of sequences like going through cloisters with light. The thickness of walls with minimum size of opening to the outside causes silence, peace and feels of safety, although with a clever planning scheme- inner courtyard- users can also enjoy their secret cave serenity and have a look at the outside world without disturbance.

Moreover, it seems that this project is also a modern transformation of single central courtyard in Iranian traditional houses to the separated court yards to make the interior spaces even more private.

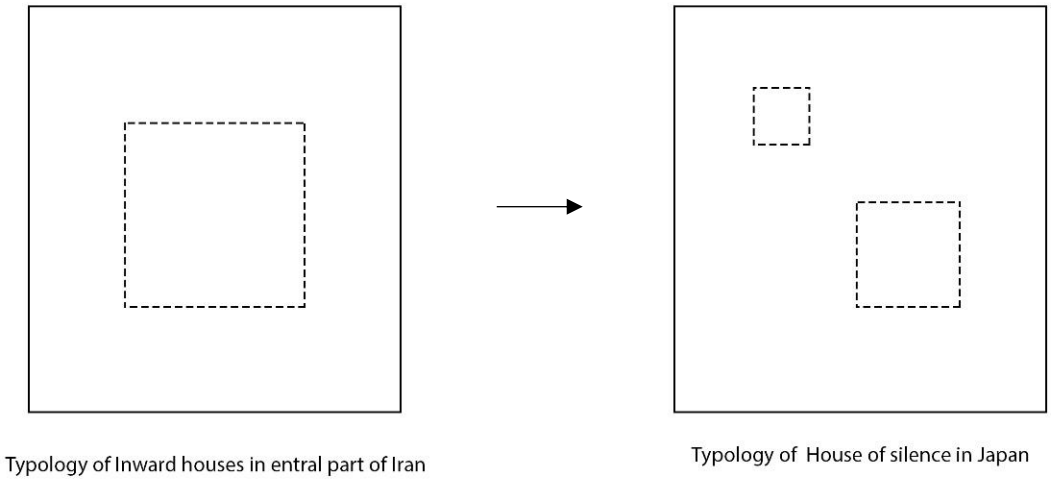


Figure 82 the transformation of single yard architecture to several yard

5.4. Summary of daylight case studies

By comparing all three case studies together I can figure out that how the issues like light and views can effect on user's perception of environment.

The first case study "SK Yee Healthy Life Centre" with the maximum connection between interior and outside through wide openings and removing almost all barriers results a cheerful environment. A place where, the users can observe simple daily routine activities like children playing or enjoying semi-private gardens and remind them the beauty of life. The variability of light which is coming inside as a sign a natural dynamism provoke them to approve that life is on the stream.

But on the other side "House of silence" with its roughness and endurance act as a strong fortress where the residents can take refuge there form all those pain and exhaustion that they suffer in the outside world. The cave shape house is like a temple for meditation and relaxation which is equipped with the beauty of atmospheric light which provides cozy and intimate spaces.

And finally, the intersection of these project can be "Health Municipal Clinic" in Void-Vacon, France which is has a neutral atmosphere. It is not opened to the outside or isolated as much as the first and third case studies are. It has its own moderate character.

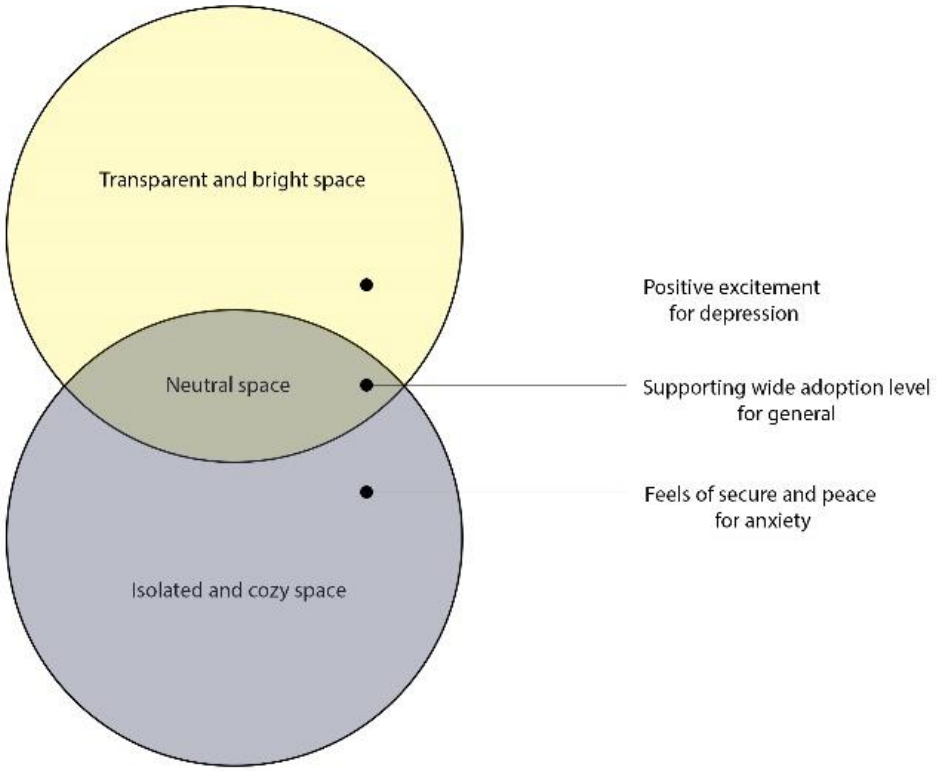


Figure 83 Categorizing case studies atmosphere

Case study of Health Center

6. Case study of health center

Generally, the mental health services centers can be categorized in group of therapeutic spaces which has their own specific program, standards, circulation and features. Therefore in order to understand the standards, demands and regulations, this part of dissertation is focused on analyzing a health center.

The **Ballarat Community Health Primary Care Centre** which is located in Lucas VIC, Australia was designed by architects Michelle Harris and Heidi Lee in 2014. (Archdaily, 2015a)

The main approach of design has been to provide a stimulating environment based on benefits of connection with nature and community. This concept tries to emphasis on health promotion and sustainability. (Archdaily, 2015a)

Figure 84 Ballarat Center Interior space

Hint: The integration of natural beauty with interiors to inspire individuals with the massage of health and sustainability.

This building is in two levels having distinguished purposes. The ground floor which is occupied by a central atrium is allocated to the more therapeutic spaces like consultant rooms as right wing. On the left side of this floor most of the functions regards to more general activities like multipurpose rooms, conference room and boarding room.

These different functions is divided and organized by the double-height central atrium which runs through center of building and causes experience of air, light and greenery.

In my point of view, the central atrium plays two main roles; one is to passively make a spacial discipline by seperating different contexts and to actively craeats a welcoming and engaging space for wide spectrum of users.

With this clear spatial order the both groups of functions, therapy and general activities, are working togehther without any disturbances. It also provides a sense of peace, privacy and quietness for therapeutic area that is merged with freshnes which is provided by central spaces. This sequences of atmosphere which leads to the more general activities on the other side of building, breaks the uniformity of environment and makes it more desirable and atractive for clients.

The other crucial point in this floor is the independent entrances on therapy area which means the need of direct connection for this ward to the outside.

The second floor is allocated to the office works for management of center and researches related to mental issues which is occupied by staffs.

Thanks to the atrium, the office spaces are well-divided to open and private. On the right side of the central empty spaces the staffs can use the shared rooms, while on the left side most of the area is divided to the private offices and meeting rooms.

In First floor the main purpose of design, in my opinion, was to create a systematic office spaces to avoid providing chaos which can be spread to the ground floor.

In term of vertical access between floors, apart from the main dramatic stairs through atrium, there is another one between the open offices area and consultant rooms. These second stairs can be used for emergency conditions and to link levels through a void that provides natural light and air circulation for the depth of the office environment.

Therefore, we can realize that the main characteristic of the health centers are the discipline and the well- organized circulation between spaces. In this case, the architects maintain these aspects via separating the functions vertically.

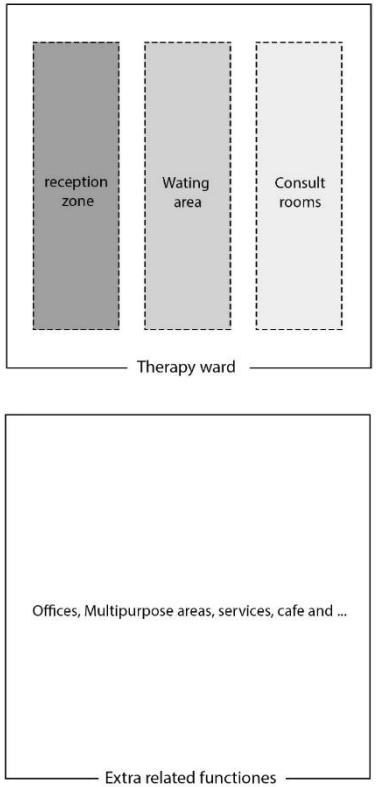


Figure 85 different floor for different function

Apart from logic of clarity in functions, the necessity of alive and vivid atmosphere can be realized as the second aspect in health centers and in this project it is provided by merging greenery and natural light through central atrium. In other words, the architects tried to design the atrium with a biophilic approach.

Figure 86 view of Atrium with natural light and Greenery

It is greatly clear that the architects of project tried to create a rational environment for the main functions with the highest rate of quietness and privacy while they tried to add more taste to the atmosphere with blurring the boundaries between indoors and outdoors and it is acted by the central atrium.

Figure 87 central atrium view

Design and Discussion

7. Design and Discussion

7.1. Site information

Geographically, Iran is located in West Asia and borders the Caspian Sea, Persian Gulf, and Gulf of Oman. Its mountains have helped to shape both the political and the economic history of the country for several centuries. With an area of 1,648,000 square kilometers, Iran ranks eighteenth in size among the countries of the world which caused various climates in the country. The north part, coast of Caspian Sea is mild and quite humid while the central part and south part covered by desert is hot and dry. (National Geographic, n.d.)

Tehran is the capital of Iran. Tehran is located in north of Iran behind Alborz mountain with a population of around 12 million in the city. Generally Tehran has a dry climate but the annual rate of rainfall in the northern part is higher than southern part closed to the central desert of country and it has created different clime and greenery from north to south of city. (Madanipour, 2019)

Tehran is the most modern city and has better infrastructure in comparison with other cities in Iran. In recent years, millions of people seeking better life emigrated from other cities of country to Tehran which created a complexity of different culture, language and social class. (Madanipour, 2019)

According to those climatic-cultural factors mentioned above and based on my opinion as a Tehran citizen, I believe that Tehran is like a focal point of country comprising almost all of Iran different climates and cultures.

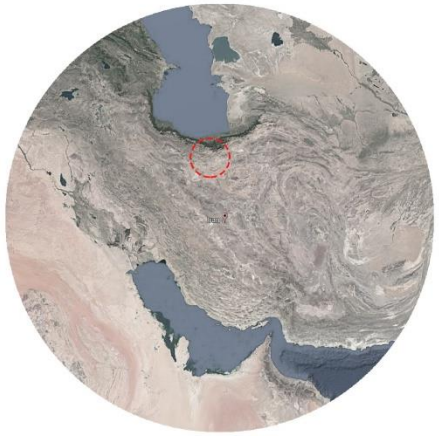


Figure 88 Google earth captured top view, Iran

Figure 89 Google earth captured top view, Tehran

In the last 30 years, Tehran municipality has started to construct 22nd district in west of Tehran. The main reason for this great and vast urban development was to link the west part of city to the central part. (Tehran Municipality, n.d.)

As it can be seen in figure 90 the south part of the district is covered by the green hill of Chitgar park. In northern part there is an artificial lake which is divided from southern part with a highway. This highway is one of the main connection between western and eastern part of the city. The site is located on the south of highway with surrounding local streets.

Figure 90 Google earth captured top view, Chitgar Lake, Tehran, Iran

7.2. Site analysis

One of the factors that I considered in process of choosing a location for my design was the density of surrounding residential area. The main reason for my choice was to provide an easy access to the health center for many local citizens. Figure 91 illustrates the high density of residential blocks with dark gray in north part of district.

Moreover, the area which is highlighted with light gray in south part is considered as a new residential area and it is under construction.

The longitude of Tehran is on the west-east axis and 22nd district is on the westernmost part of the city. But thanks to the west east highway it is also accessible for the other citizens coming from other areas. The local streets around the site provide access for locals and maintenance.

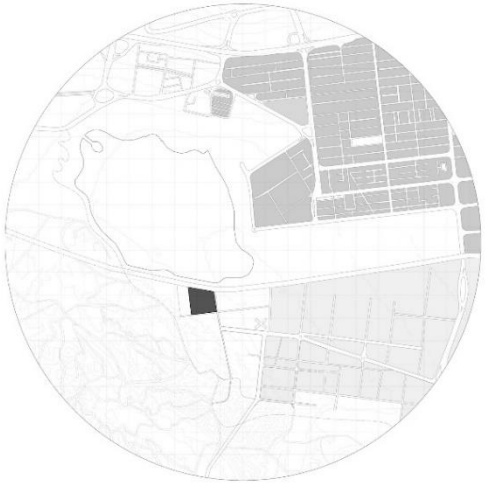


Figure 91 22 district plan/ residential area density

Figure 92 22 district plan/ access to the site

Furthermore, one of the troubles about mental health status in Iran is the lack of knowledge about psychological illnesses which can exacerbate this social dilemma. Therefore, apart from the importance of natural scenery on the expression of interiors, I chose the site with a natural-recreational neighborhood based on the idea of linking the lake and the green hills. From my perspective, this idea can convince more people to visit the center, where the public activities and exhibitions will spread knowledge about reality of mental illnesses.

Tehran is located in the middle-east with high elevation of sun and the long sun path during the day time. Hence, the days are long and daylight is available for many hours of the day and through different seasons.

The day-length in Tehran on 21th of January (Winter solstice), March (vernal equinox), June (summer solstice) and September (autumnal equinox) are respectively: 10:08, 12:09, 14:34 and 11:06.

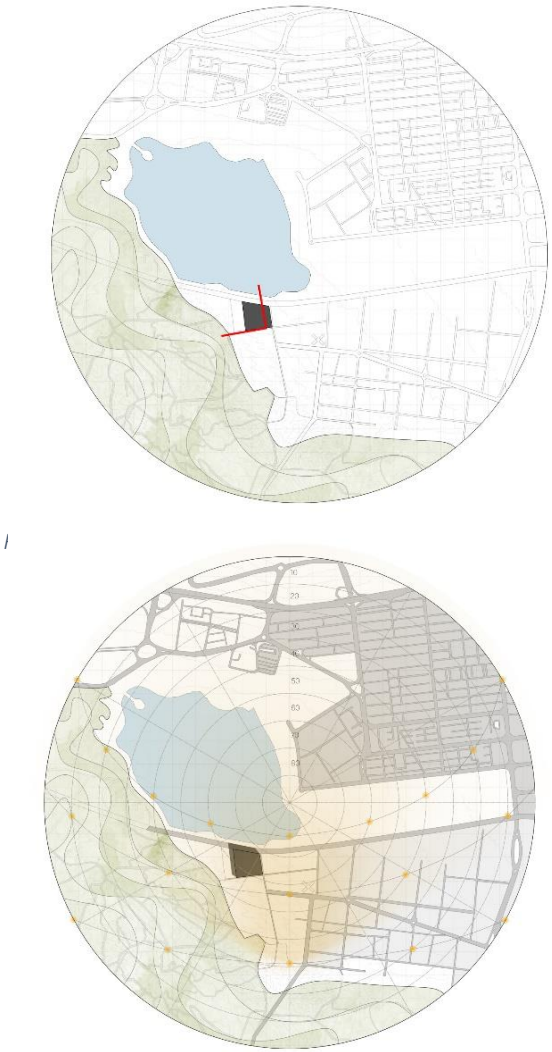


Figure 93 22 district/ sun path

7.3. Site design

In order to provide opportunity of visiting the site with more users I extended the site from green hill in south to the border of lake in north. The site cuts the highway. Therefore, an underground access along highway is considered to avoid disturbing the vehicle traffic.

The local street on the east part provides a vehicle access to the site. I also allocate the east of site to the parking lot to shorten the car path. This idea will keep the atmosphere quiet and will provide more comfort for pedestrians.

The building is located at the middle of site to provide almost equal footing path in different directions. The pedestrian access on the south can be used by green hill visitors to access the center. The other access from east local-street is faced to the main entrance of building and provide the shortest path for pedestrians.

One of the functions that is considered is an exhibition area. This semi-open exhibition is located in south of the site with a little distance from building to avoid any disturbing for light and view access inside the building. This exhibition area contains a restaurant and café at the southern part.

The other open activity is a play-ground for children. Most of the clients of this center might be families who are accompanied by their children. With a safe space for children, parents spend their time in the center without worries.

Finally greenery is considered as one of main elements in site design. A large part of the outdoor space is dedicated to the greenery to not only create a cheerful experience for users and add more qualities to the interiors, but also to positively influence the neighboring urban spaces.

It can be imagined as a short journey through a local park where the users can also gain influential knowledge about mental health. By passing the green hills, walking through the site, the users will end their journey at the edge of lake where they can enjoy the view of northern mountains of Tehran.

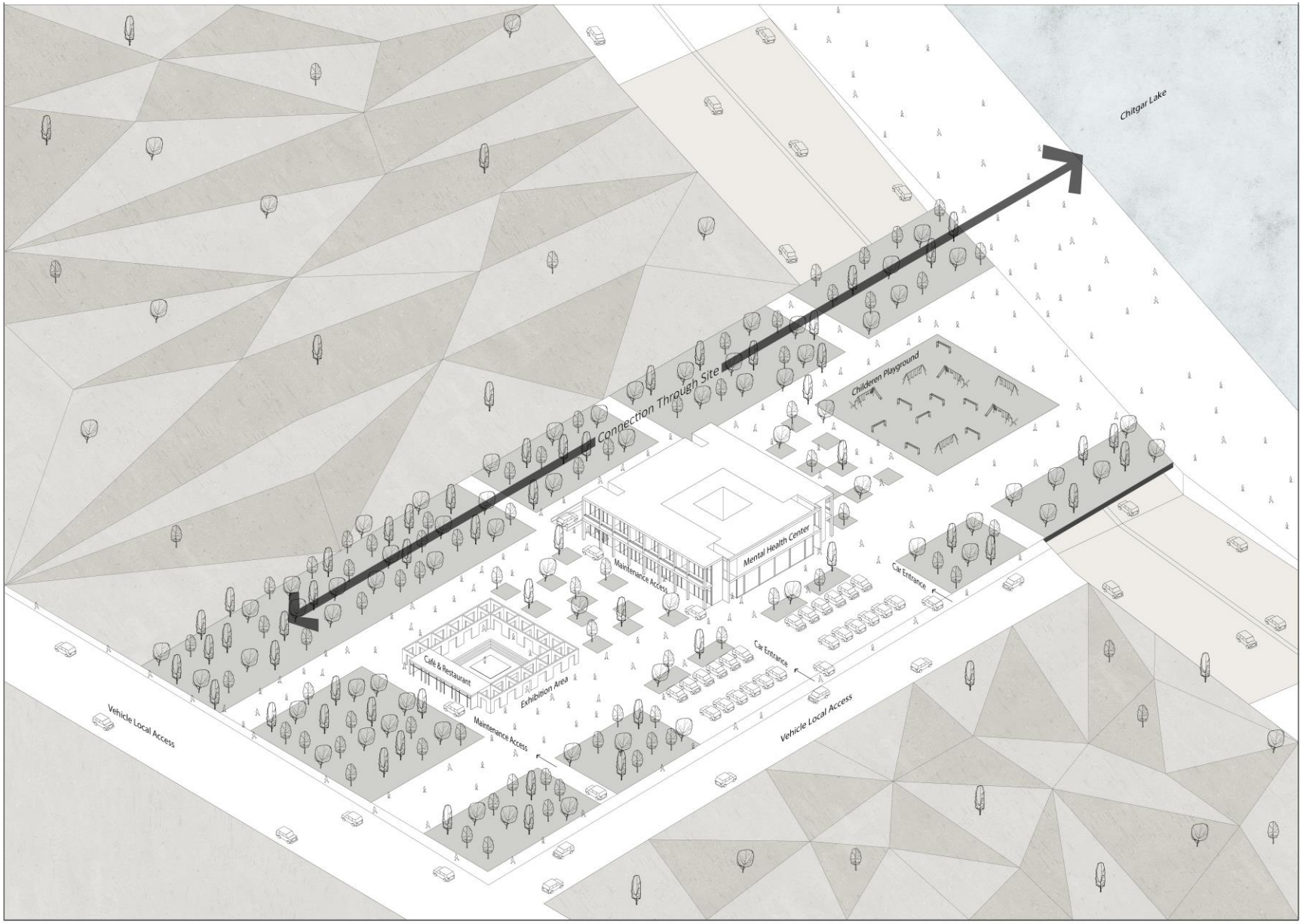


Figure 95 Landscape isometric

Figure 97

Figure 96

7.4. Concept and process of building design

As it was discussed earlier, the main objective of this thesis is to provide the most suitable environment for the group of depression and anxiety. The main concept is to create a cheerful atmosphere for depressed patients by brightness and visual communication with the outdoor environment. While, the spatial needs of anxiety group will be provided by a cozy and intimate atmosphere with higher privacy and darker interiors.

My concept for achieving these goals is to combine two different inward and outward architectures. Through my study about Iranian traditional architecture I learned that in the central part of Iran with dry and harsh climate and privacy as a general trend, most of the buildings had central courtyard. This typology had provided highest level of privacy for users where the interiors had access to the natural light with the aid of inside garden. In my opinion this type of architecture creates a real cozy and intimate space.

By merging these typologies together not only the building maintains both depression and anxiety group needs but also it can provide a flexible choice for patients to express themselves through different atmosphere.

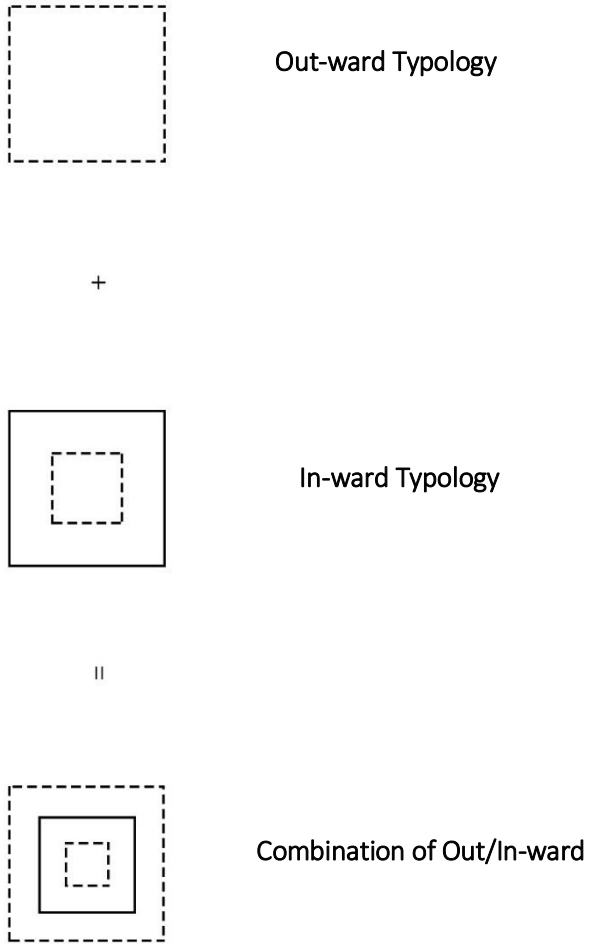


Figure 98 diagram of design concept

According to the aforementioned concept, the designing process is as follows:

- **Considering all spaces with different atmosphere as a single mass in order to provide more privacy**. The connection between spaces can be easier and safe for users when we provide all functions together.

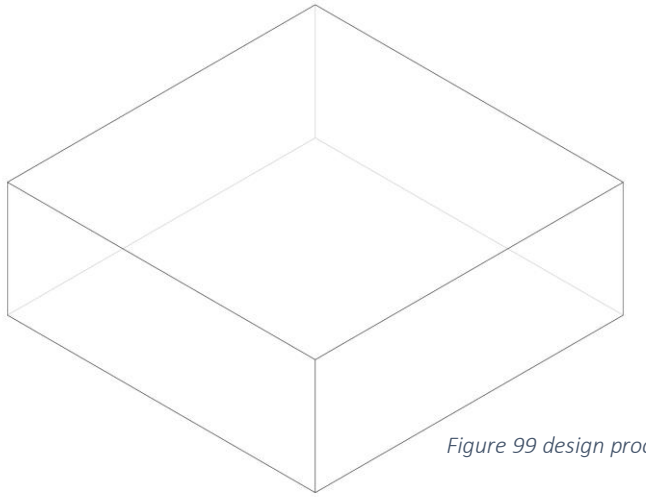


Figure 99 design process diagram-1

- **Wide openings towards the north and the south to take advantage of natural light and scenery for outward part**. Due to differences of light coming from different direction and differences of view the atmospheres of spaces will be also various.

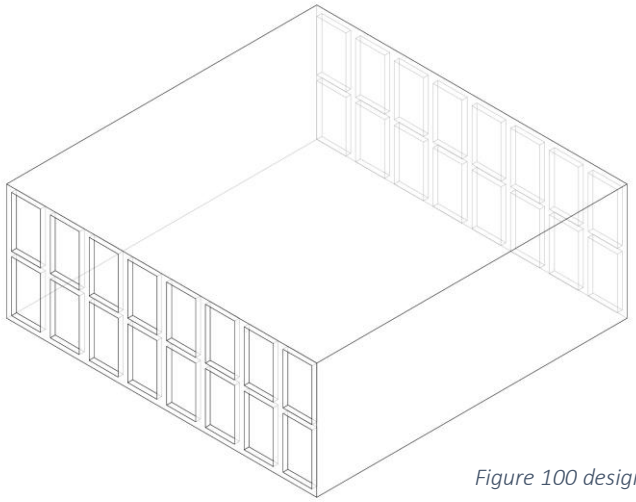


Figure 100 design process diagram-2

- Central area for the outward part. With the idea of embracing the inward part, the level of privacy and quietness in central area will be increased.

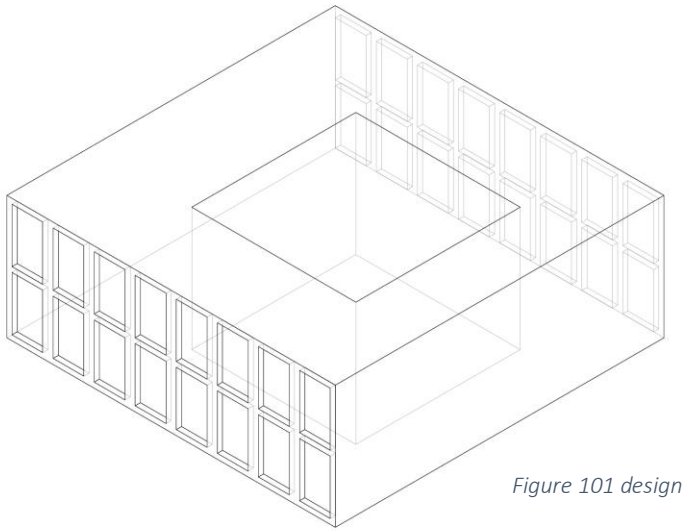


Figure 101 design process diagram-3

- Creating a central yard for the inward part in order to provide access to the natural light.

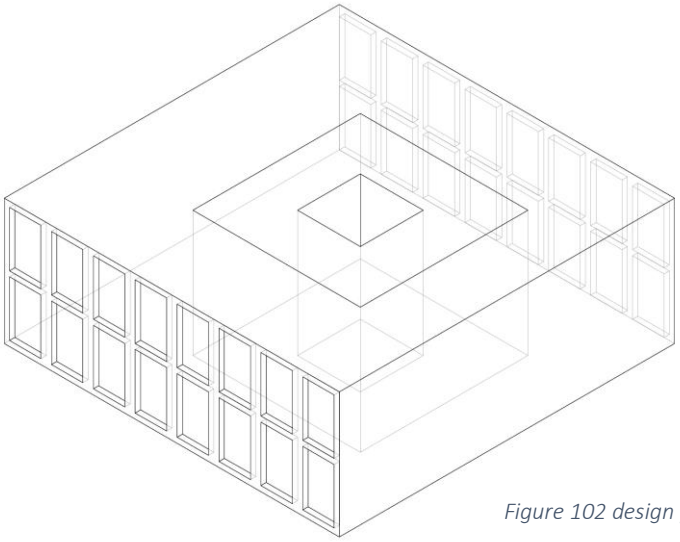


Figure 102 design process diagram-4

- **Extending the in-ward part to the outer layer of building to comprise the entrance area as a private part.** This idea is coming from Iranian culture to have a private space for arrival guest and users.

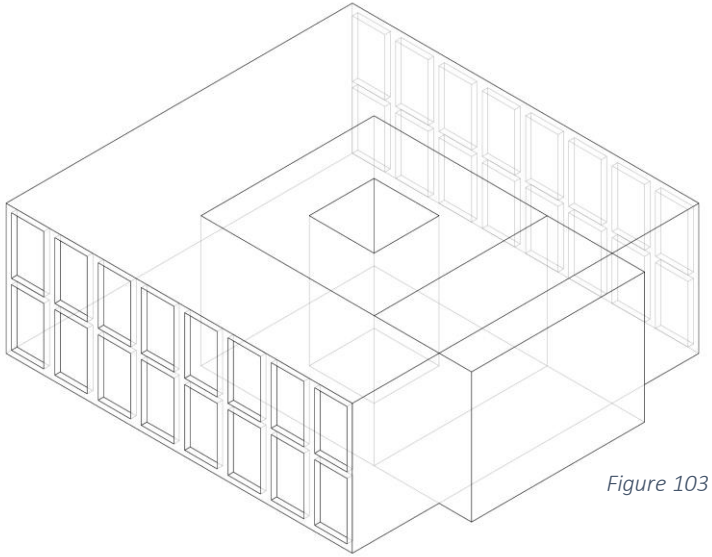


Figure 103 design process diagram-5

- **A retreat of corners to the inner layer of building which are used for entrance and exits.** These spaces are also considered as the voids to allow more light penetrate to the depth of building.

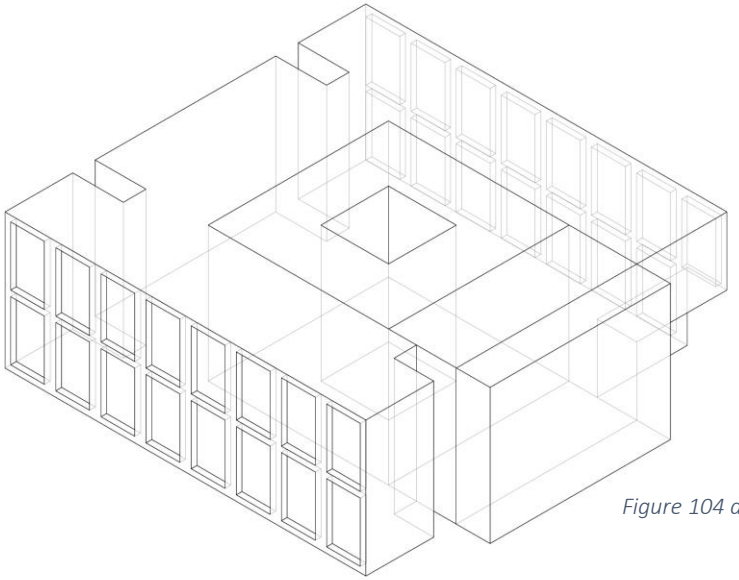


Figure 104 design process diagram-6

- **Projected facades by the porches and balconies.** The created semi open spaces will act as a buffer zone to ban direct sun light beams coming inside. Moreover, the spaces created in second floor will be used as the private gardens for outward part.

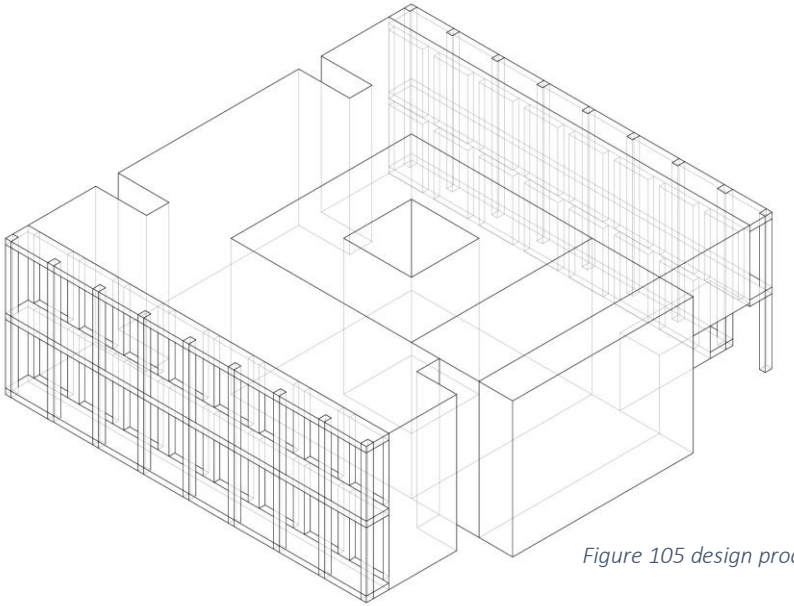


Figure 105 design process diagram-7

- **Lifting up the central part to create access to central yard in first floor**. It will also cause a stream of spaces with different light brightness, privacy and character.

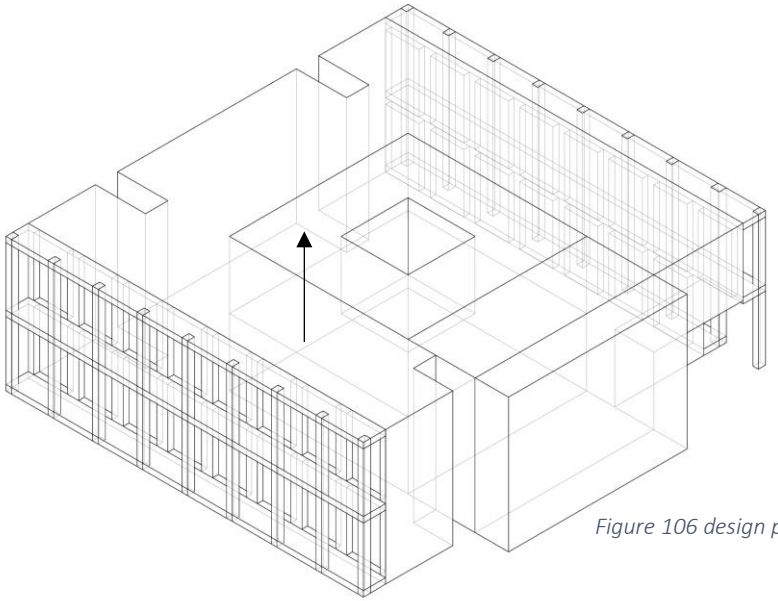
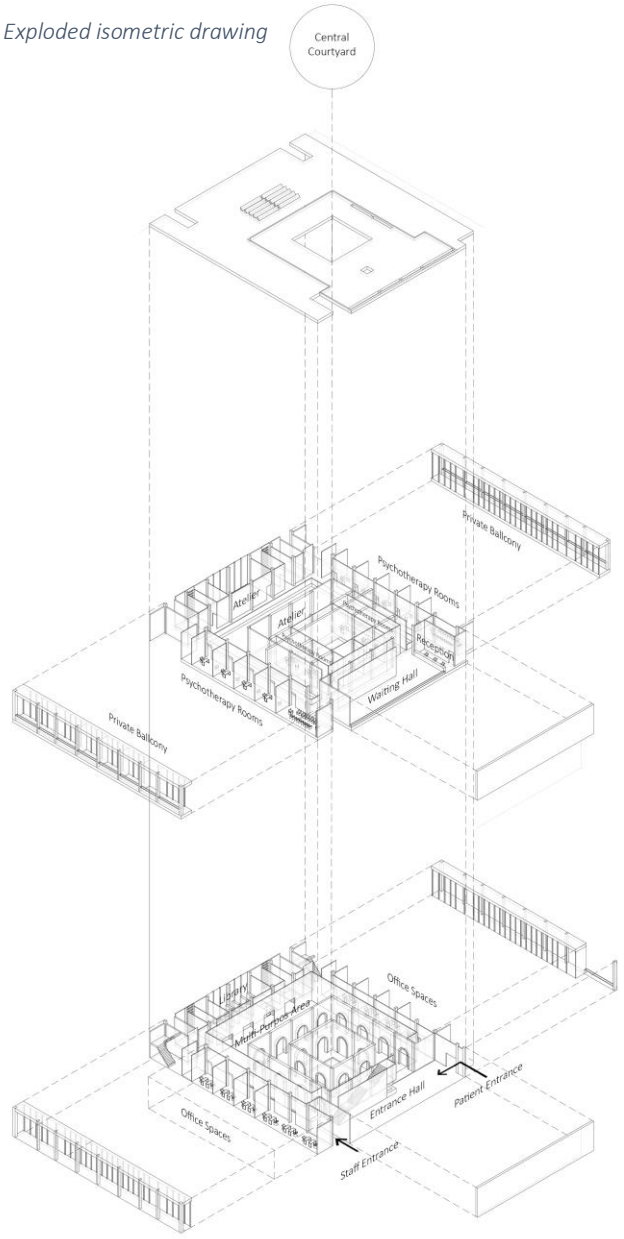


Figure 106 design process diagram-8

Figure 108 Main entrance view perspective

Figure 107 Exploded isometric drawing



Based on the case study which was associated with identifying space's necessities and standards for therapy institution, the main characteristic of therapy spaces is discipline. In other words, the spaces should not interfere with the functioning of each other. Therefore, I arranged the spaces in two groups of office and therapy in the first and the second floor respectively.

With the idea of allocating upstairs to the therapy part, the quietness and privacy of patient's spaces will remain.

Therapy Spaces- Second Floor

Office Spaces- First Floor

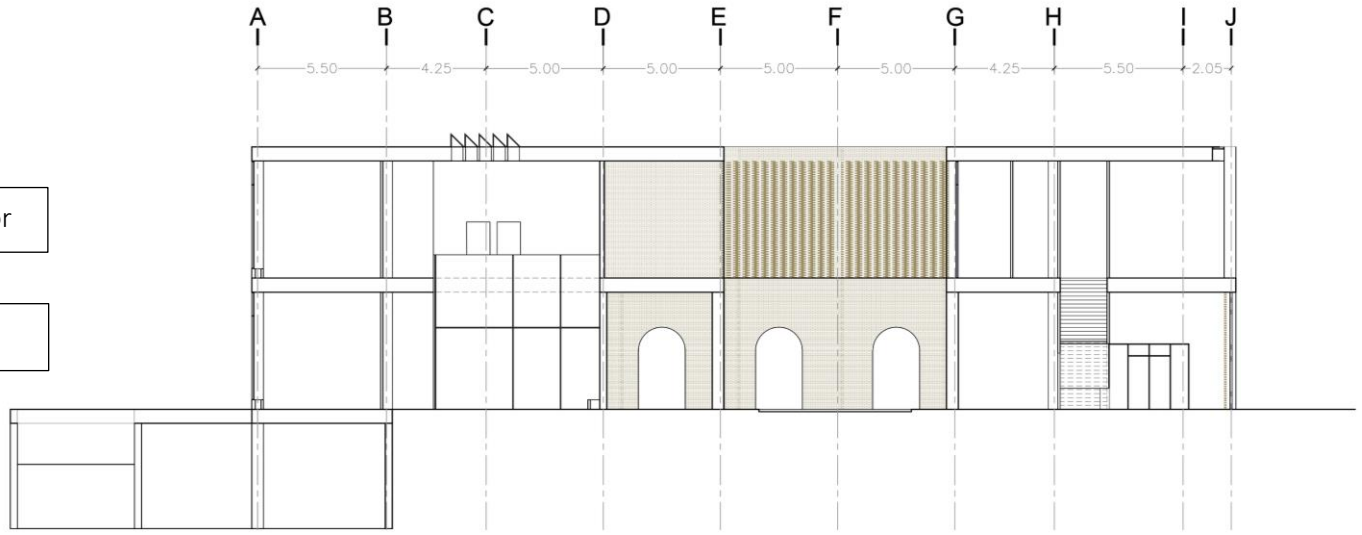


Figure 109 Section A-A

7.4.1. First floor: Office and multipurpose spaces

The First Floor comprises Entrance hall, offices, meeting rooms, multipurpose hall, exhibition, library, media room, etc. As it was mentioned the entrance area is considered as a part of inward structure for more privacy.

The offices are located in the southern part with wide openings toward the green hills. The northern part is allocated to the meeting rooms and media room being used for seminars and lectures.

For keeping the central yard and multi-purpose hall quite, the exhibition area is organized around courtyard. It also acts as a space to moderate the incoming light through central yard.

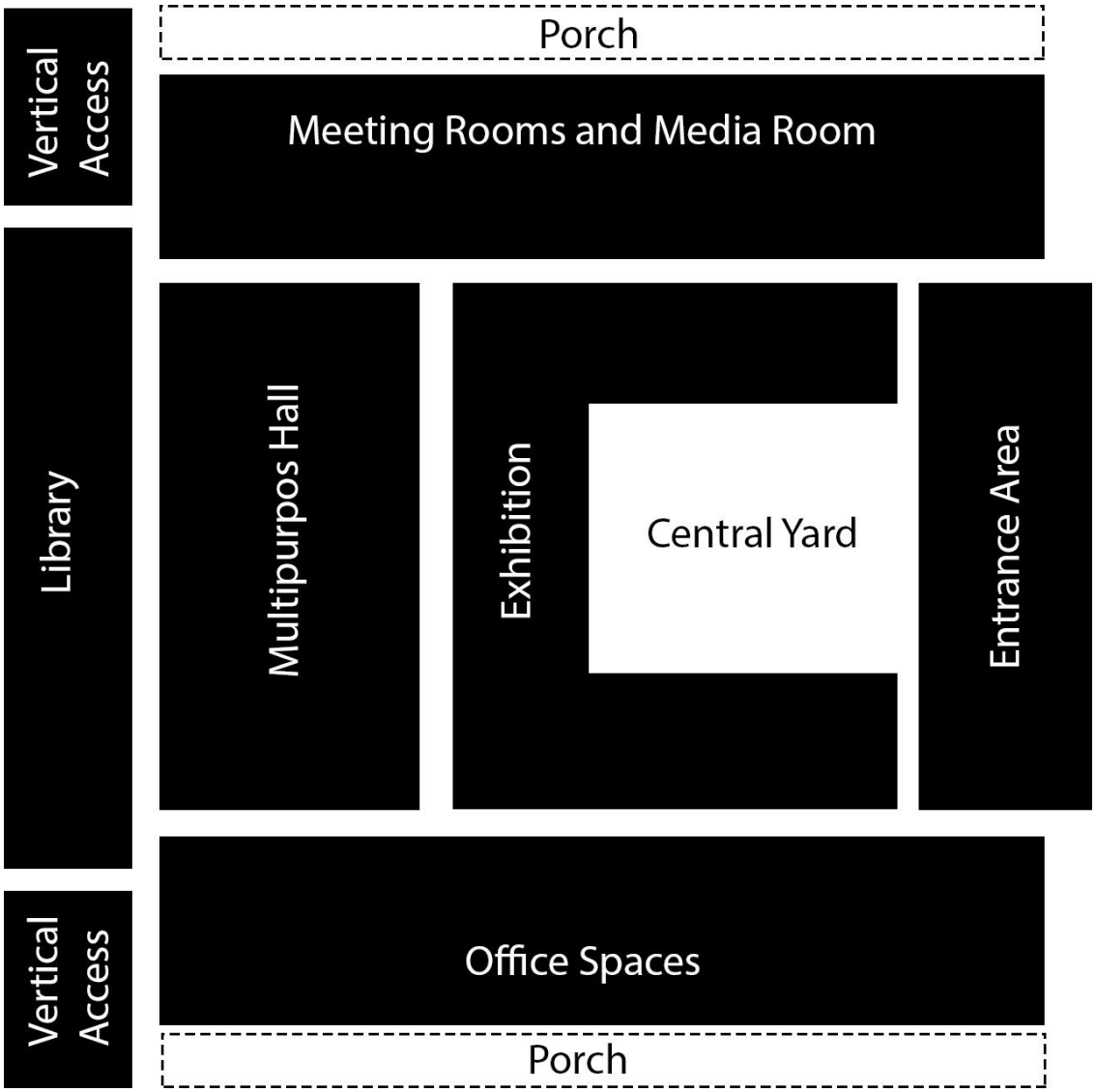
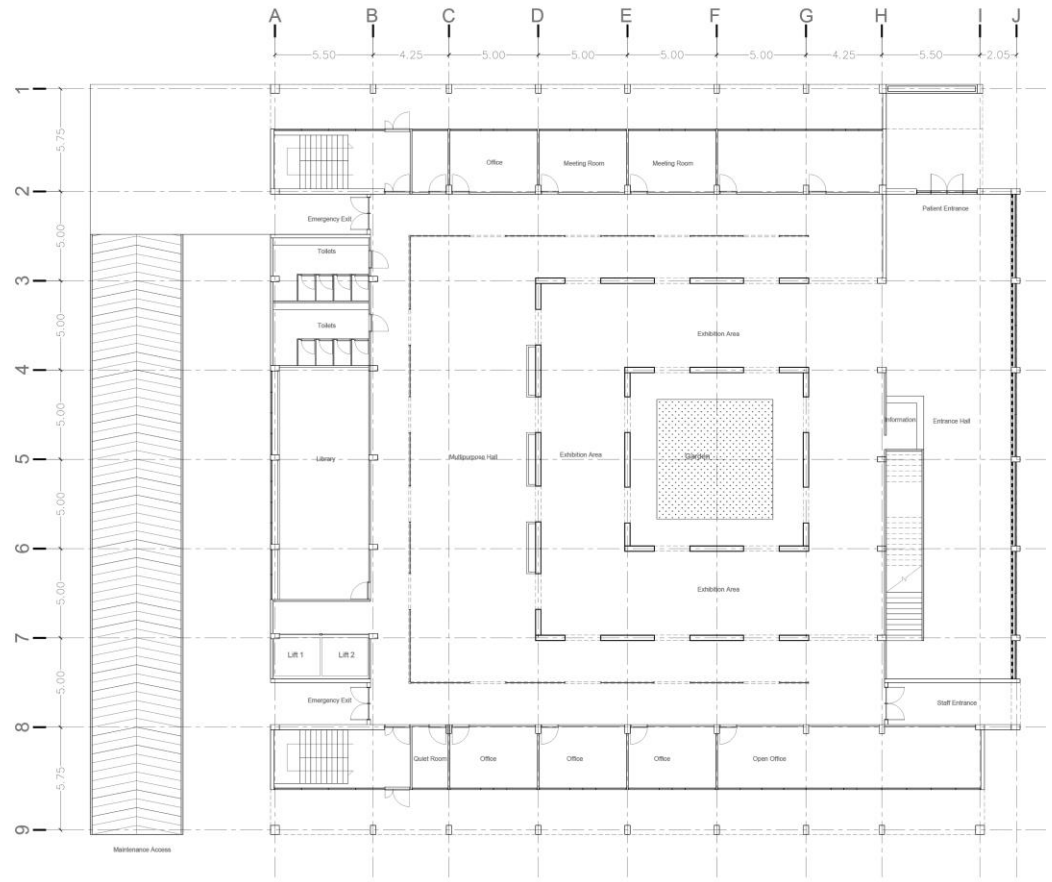


Figure 110 First floor- Function of spaces



Offices	128.29 m2
Meeting Rooms	36.86 m2
Media Room	36.50 m2
Staff Breakout & QUiet Rooms	34.49 m2
Entrance Hall &Information Desk	154.66 m2
Library	57.68 m2
Staires & Lifts	108.82 m2
Multipurpos Hall & Coridors	461.92 m2
Exhibition Room	301.67 m2
Central Courtyard	92.15 m2

Figure 111 First floor plan

7.4.2. Second floor: Therapy spaces

The Second floor is specifically set aside for therapy services. This floor is containing waiting hall, depression and anxiety group consulting rooms, and ateliers for patient's art products.

The depression group consulting rooms are located in north and south part of outward structures. The rooms all have private balconies.

The anxiety group consulting rooms are around central yard which makes the rooms illuminated by daylight while keeps them private.

The waiting hall is above entrance area and linked to the first floor through a straight stairs case.

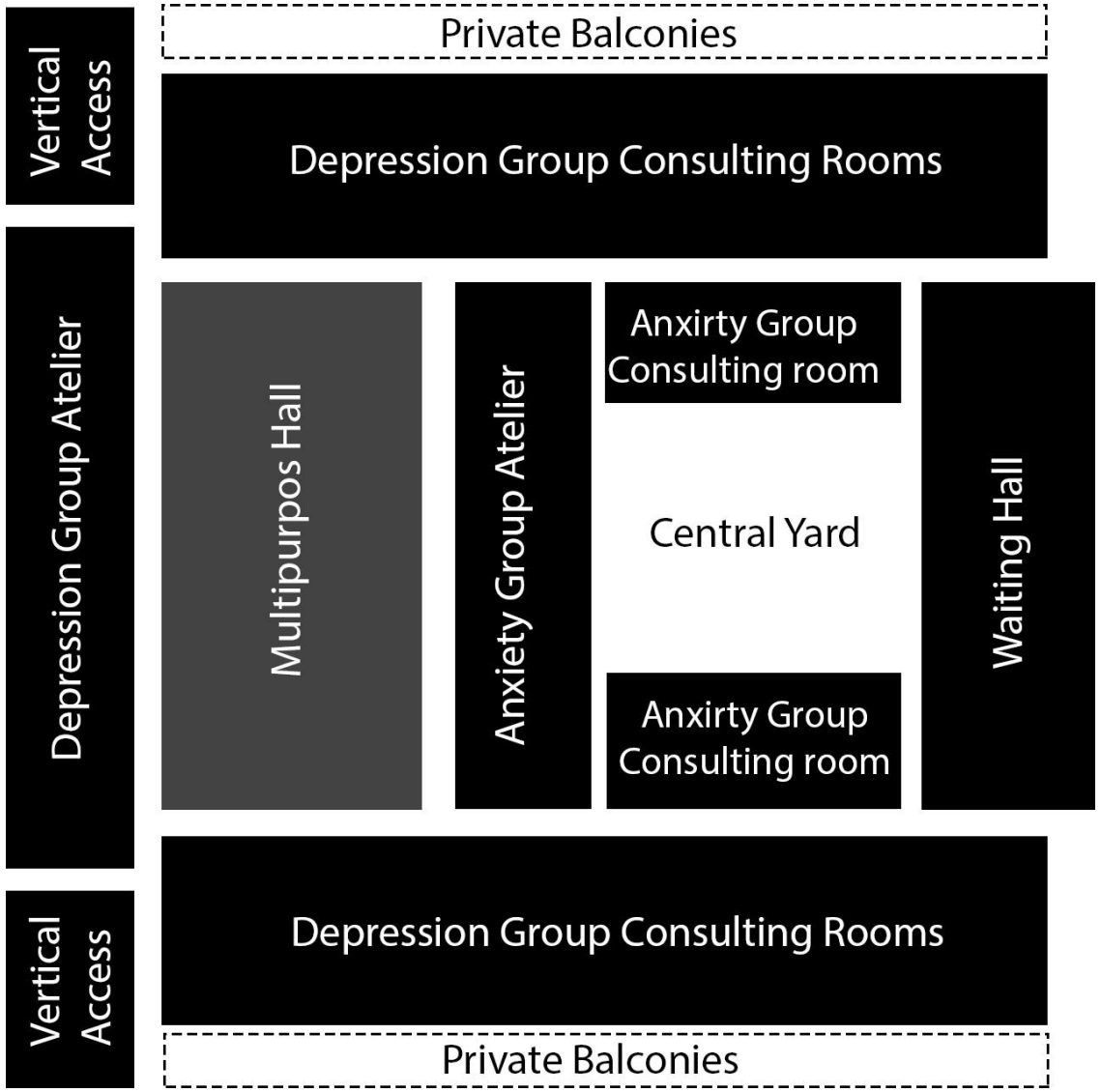
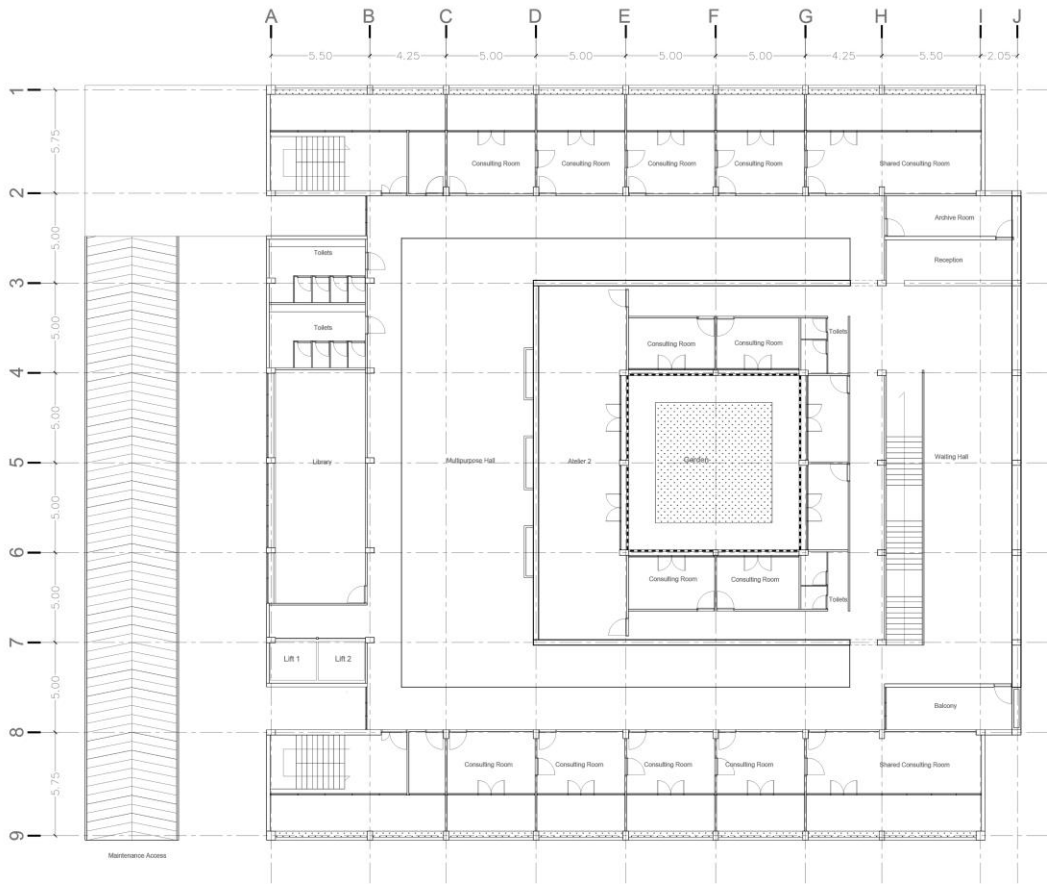


Figure 112 Second floor- Function of spaces



Psychotherapy Room	305.36 m2
Atelier For Art Therapy	162.22 m2
Balconies For Therapy Rooms	198.00 m2
Waiting Hall & Reception	156.00 m2
Services	46.76 m2
Staires & Lifts	108.82 m2
Coridors & Multipurpos Areas	255.60 m2

Figure 113 Second floor plan

7.5. Openings and light controllers

Psychotherapy Room Type 1 for depression group are located in outward part. These rooms with wide openings provide the highest amount of connection with outside and brightness. The balconies are separated with porous walls to create private gardens. The balconies also act as a buffer zone to block direct sun light beams. Thanks to the natural scenery, the users of these rooms can enjoy views of the lake and the hills. These features make the room cheerful but still private.

Psychotherapy Rooms Type 2 which are arranged in inward part provide more private and cozy environment for patients. The barriers between rooms and central courtyard are hallow brick walls which filter and control the light coming inside.

In both rooms, there is no direct sun light, although they have different atmospheres due to different levels of brightness and openness.

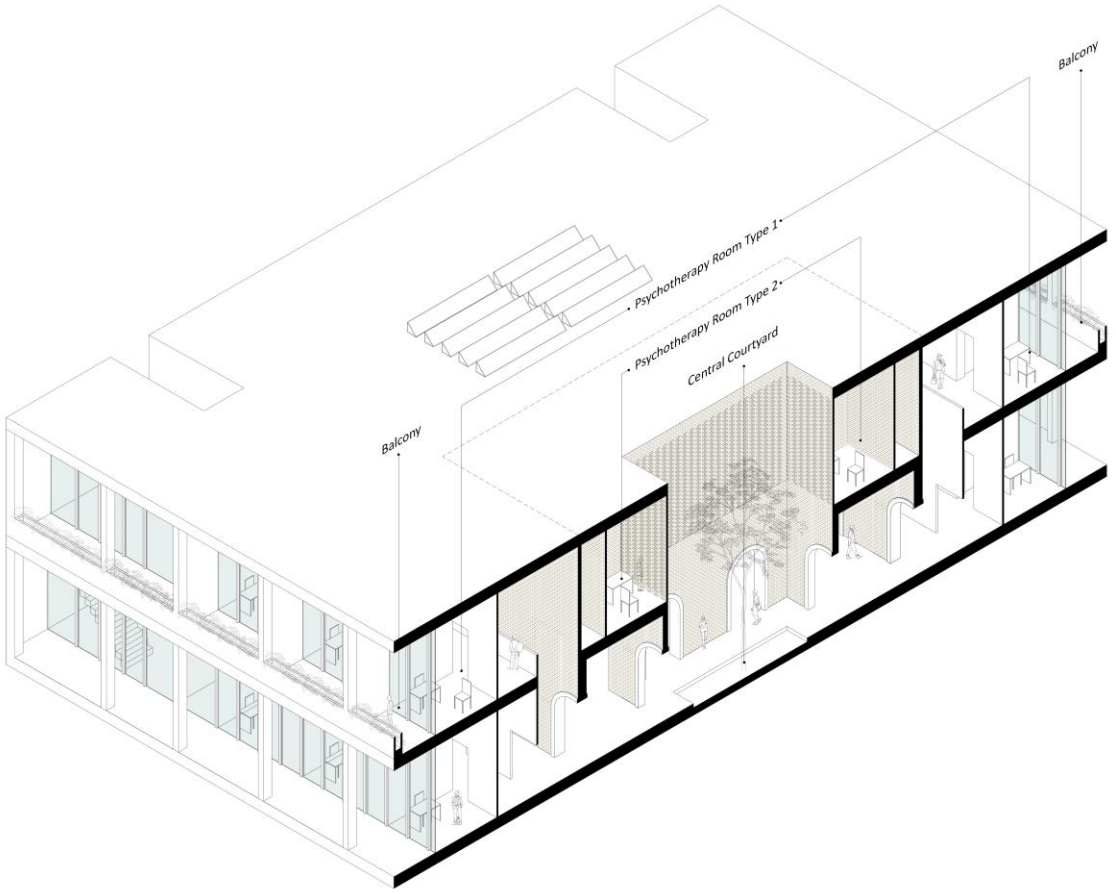


Figure 114 Isometric section

Figure 116 Render of Psychotherapy room type-1

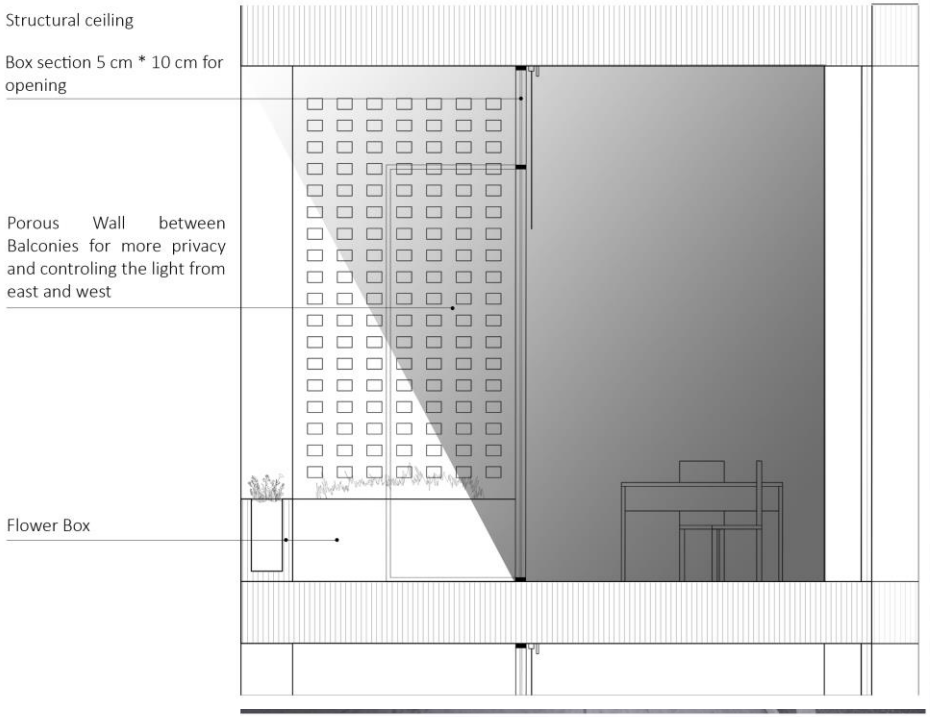


Figure 115 Section of psychotherapy room type-1

Hint: The Balconies in front of each therapy room's type -1 can be used during long summers in Tehran. The space of balconies can be add to the interiors. It will liven up atmosphere.

Figure 118 Render of psychotherapy room type-2

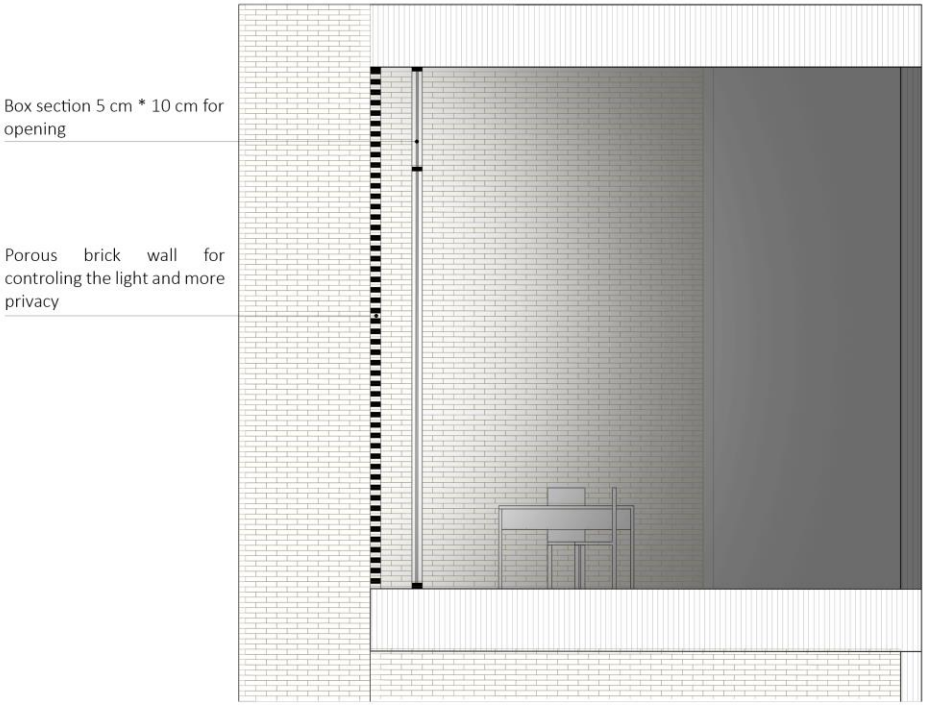


Figure 117 Section of psychotherapy room type-2

Hint: The barriers between rooms and central courtyard are porous brick walls which are inspired by "Shabak" in Persian traditional architecture. The light coming through these walls are monotonously spread in interiors which makes the rooms to express more sense of peace.

In order to minimize the disturbing features of natural light and more specifically the resulting issues from directs sunlight beams, the flexible controller of day light is considered. It will create changeable atmosphere by modifying the light and amount of connection to the outside world.

Figure 119 Psychotherapy room type-1, renders for light controller

Time and incoming light

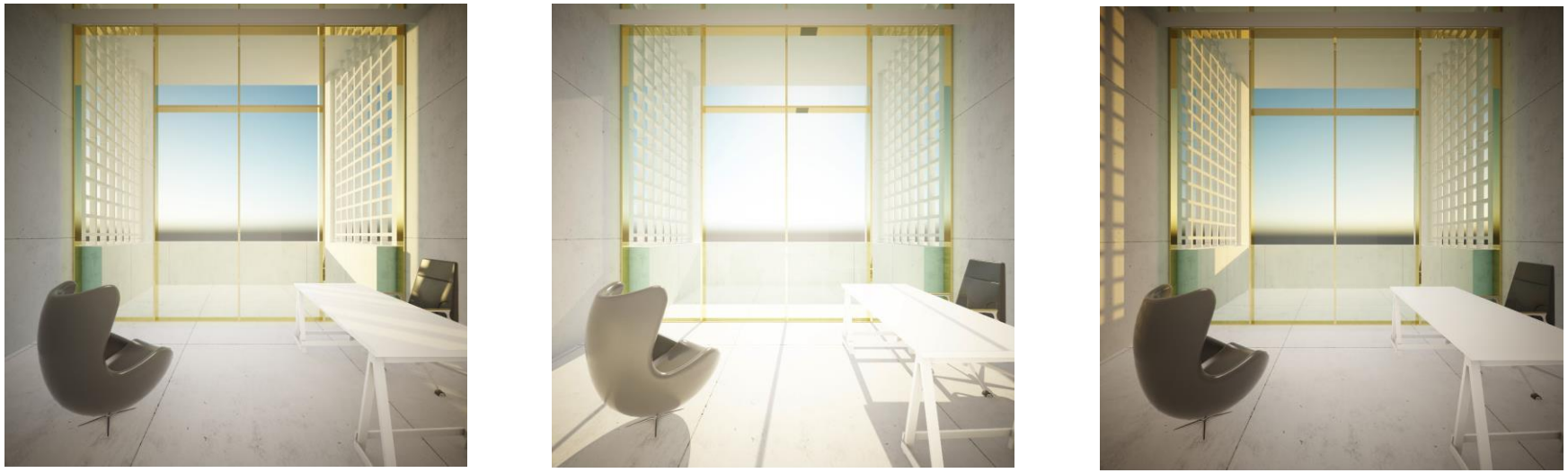


Figure 120 left to right: 21st of June, 8am, 12 and 4pm therapy room type 1

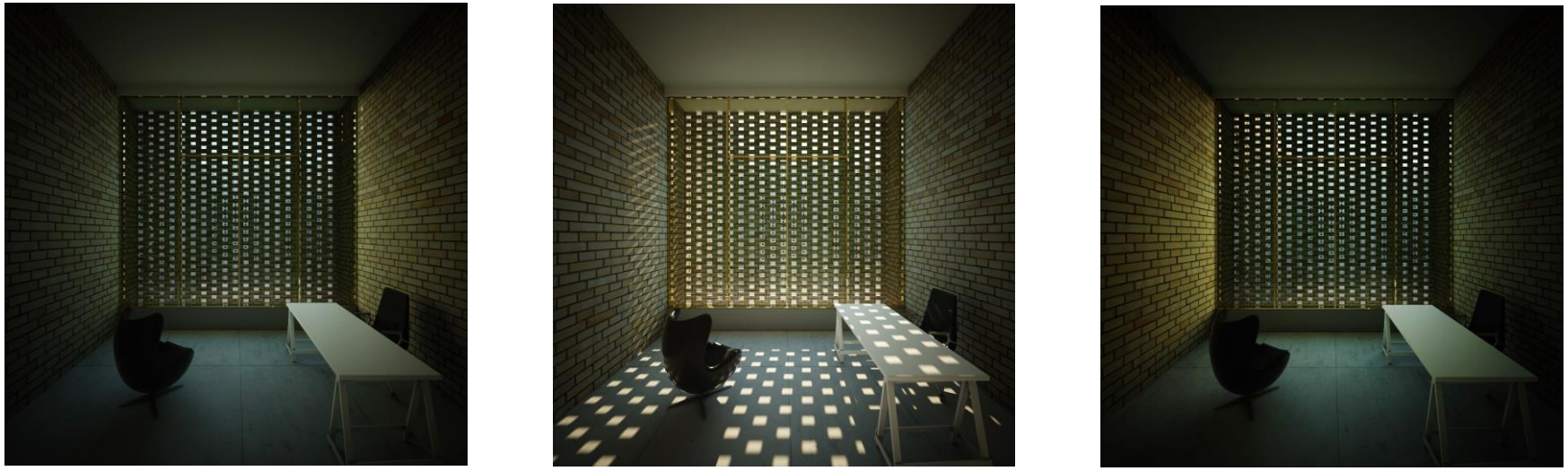


Figure 121 left to right: 21st of June, 8am, 12 and 4pm therapy room type 2

Moreover, the openings of the ateliers are different. In art workshop for anxiety group, the openings are the same as those in therapy rooms for this group. The same approach is used for depression group ateliers. The result is differences of brightness, privacy and atmosphere in ateliers.

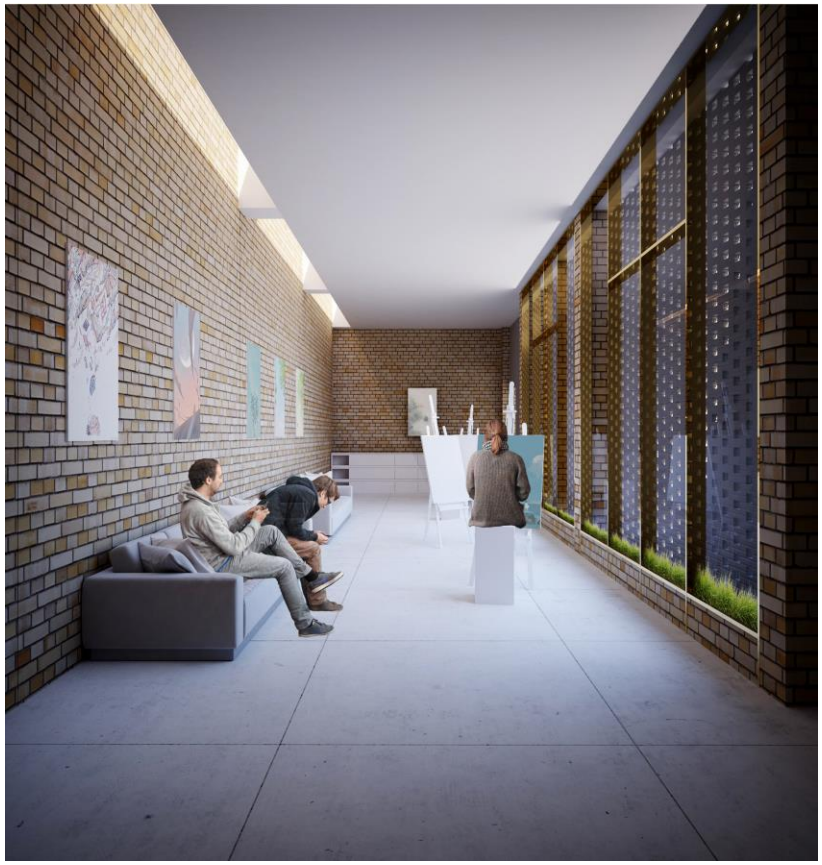


Figure 122 Render of atelier for anxiety group

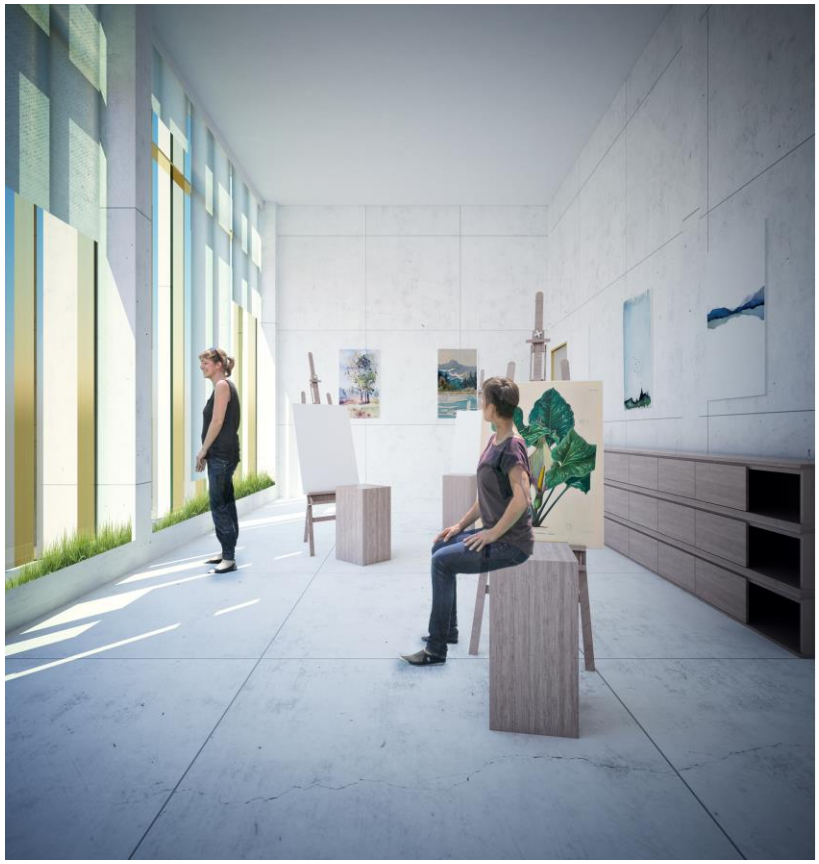


Figure 123 Render of atelier for depression group

Because of cultural reasons, the entrance is the most private space in most of Iranian buildings and architects try to use architectural elements to reduce visual connection between inside and outside to respect users desire. In Iranian traditional architecture, the apertures like ceiling opening and “Shabak” were used to allow natural light to come inside during day time without disrupting of occupants’ privacy. With the same approach I decided to keep privacy of entrance hall on the first floor and waiting hall on the second floor.

In term of designing the opening for these spaces, the main effort was to use Iranian traditional architecture elements in a modern shape. In first floor the barrier between interior and outside is a porous wall with rotated bricks which is inspired by the Shabak.

In the second floor the only access to the daylight is a long ceiling opening through waiting hall. The shape of opening is in contrast with Rouzan (the hole at the center of dome), but the function is similar.

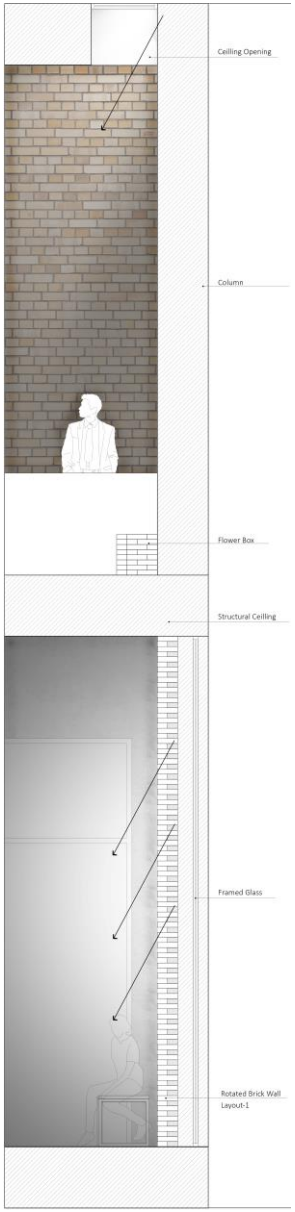


Figure 125 Entrance space section

Figure 124 Render to eastern elevation

Hint: With the idea of using rotated brick wall, there is a sequence of darkness- brightness which can break the uniformity of atmosphere. It can also represent the rest of building and remind the incoming users the importance of day light in designing of building.

Figure 126 Render of entrance hall

Figure 127 Entrance hall, hallow wall, front view render

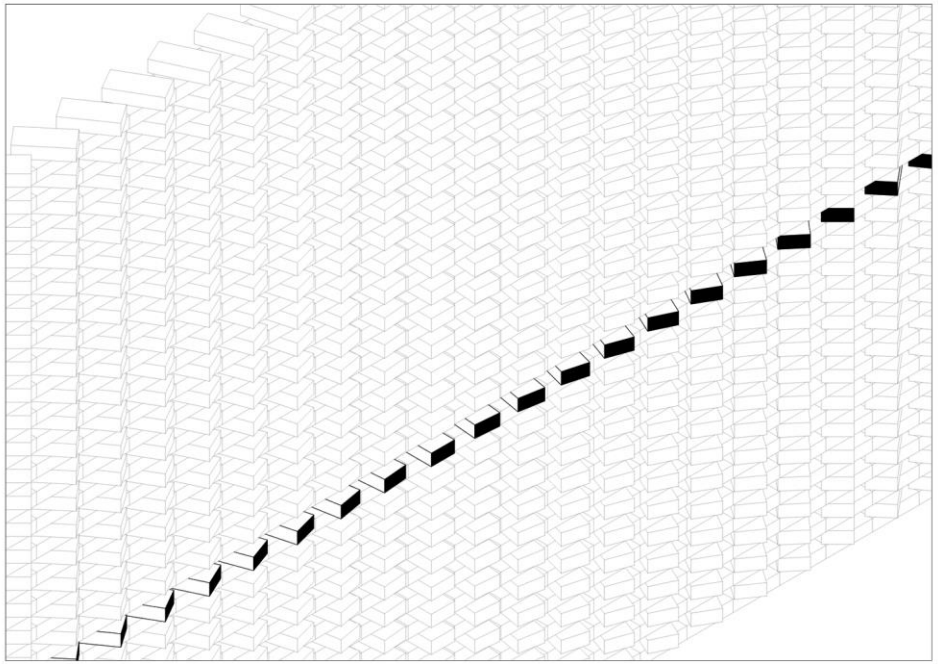


Figure 129 hallow wall isometric detail

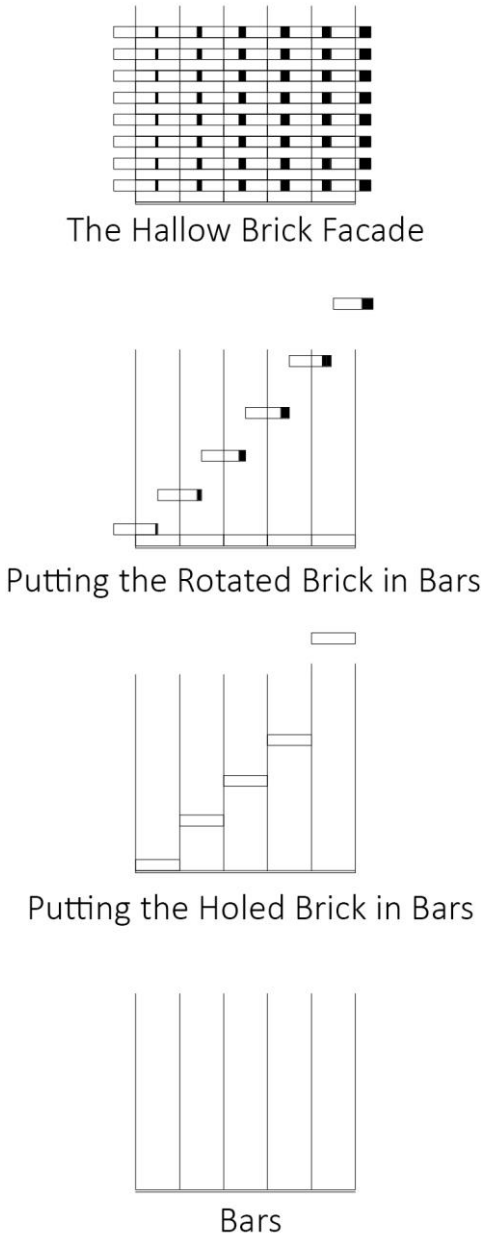


Figure 128 Hollow bar formation diagram

Hint: Thanks to the thickness of ceiling and high elevation of sun in Tehran, the entry of the sun light beam is not possible. The other reason of elongation of ceiling opening through the hall is to emphasize on the location of reception desk at the end of corridor. In my opinion, this opening can be imagined as an arrow that points to the specific location.

Figure 130 Render of waiting hall and reception

The other purpose of this design is to provide different atmospheres through different spaces that allows users to choose where they want to spend their time during their presence in center.

It will help them to choose their location based on their feeling. It seems that all the spaces act as a dimmer and users can set the level of light and privacy through their environment alternative.

As it is illustrated in renders above, the intensity and quality of light coming to the interior spaces are different due to variety of openings, and the users will experience different characters of spaces through their journey inside the building. The central yard is the focal point of the building with direct light and the highest amount of contrast. This difference can break the uniformity of spaces and express different mood.

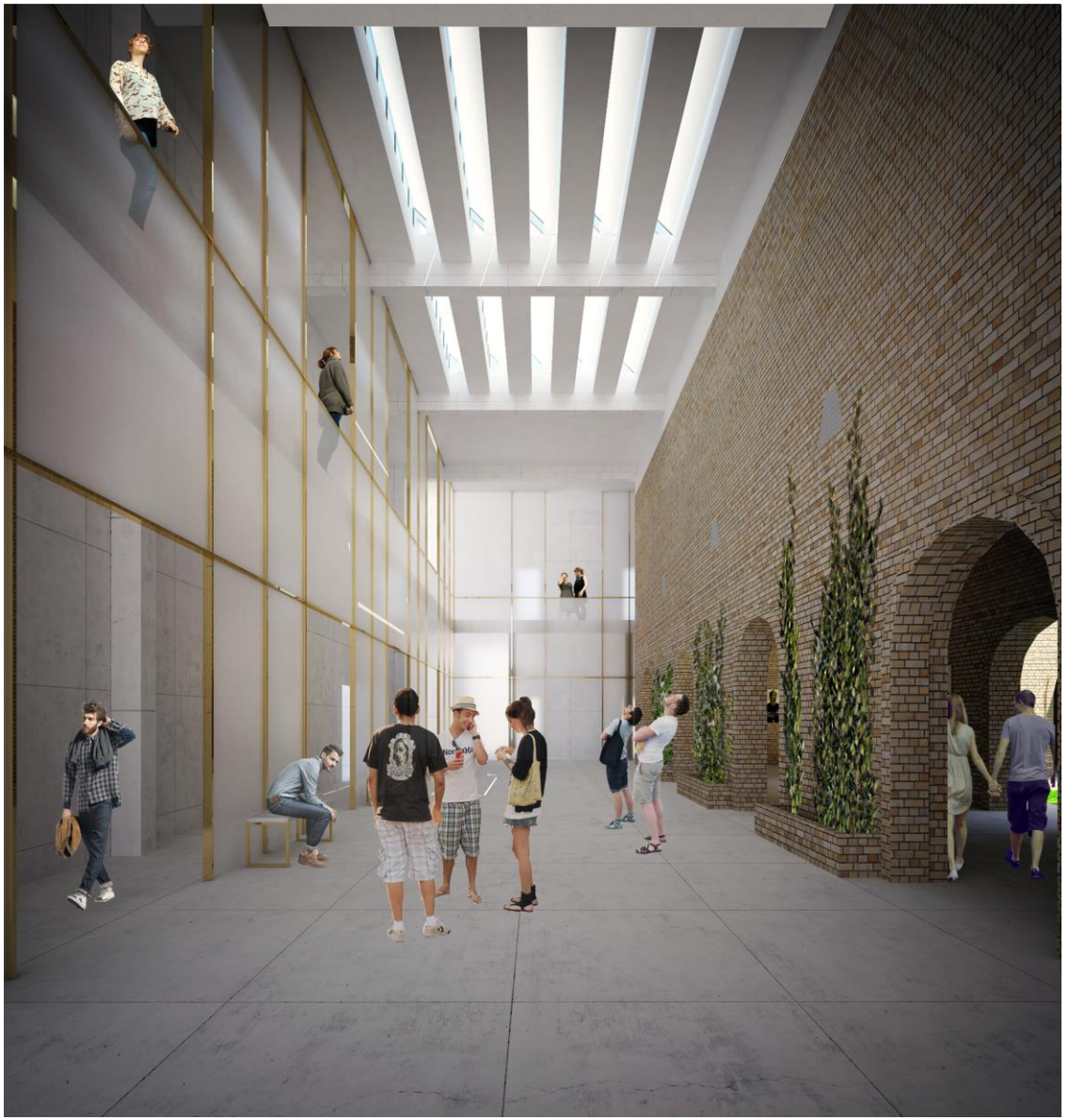


Figure 131 Render of multipurpose hall

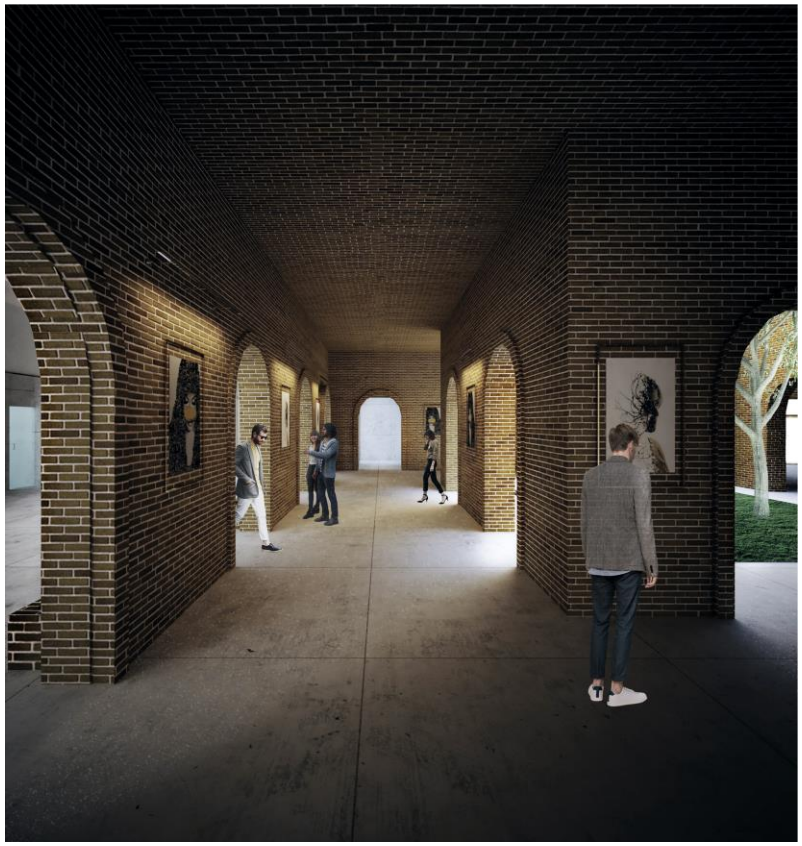


Figure 133 Render of exhibition space

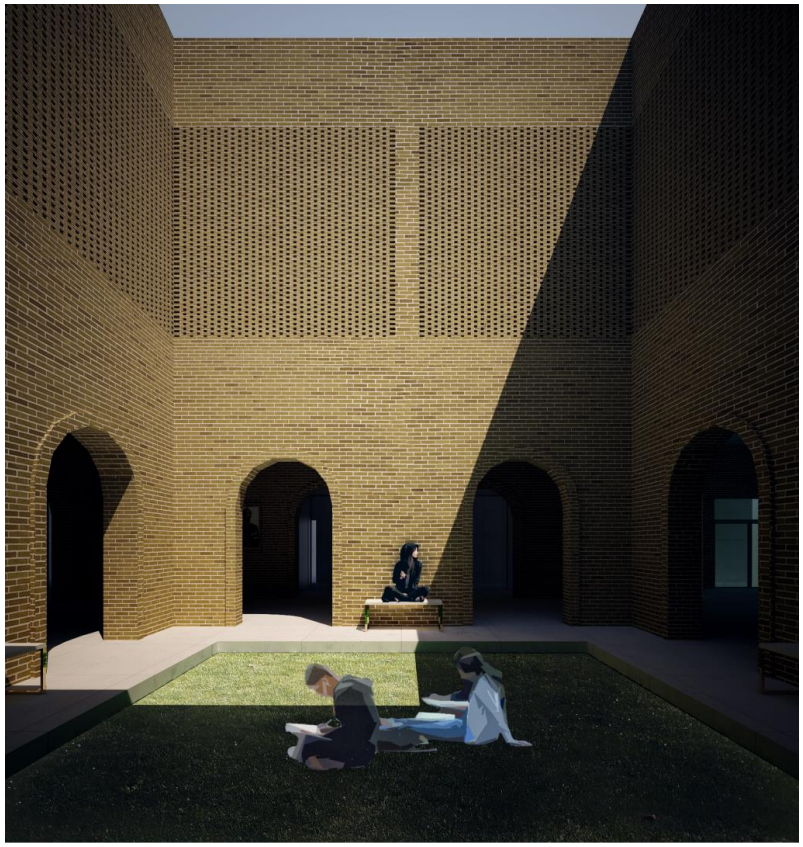


Figure 132 Render of central yard

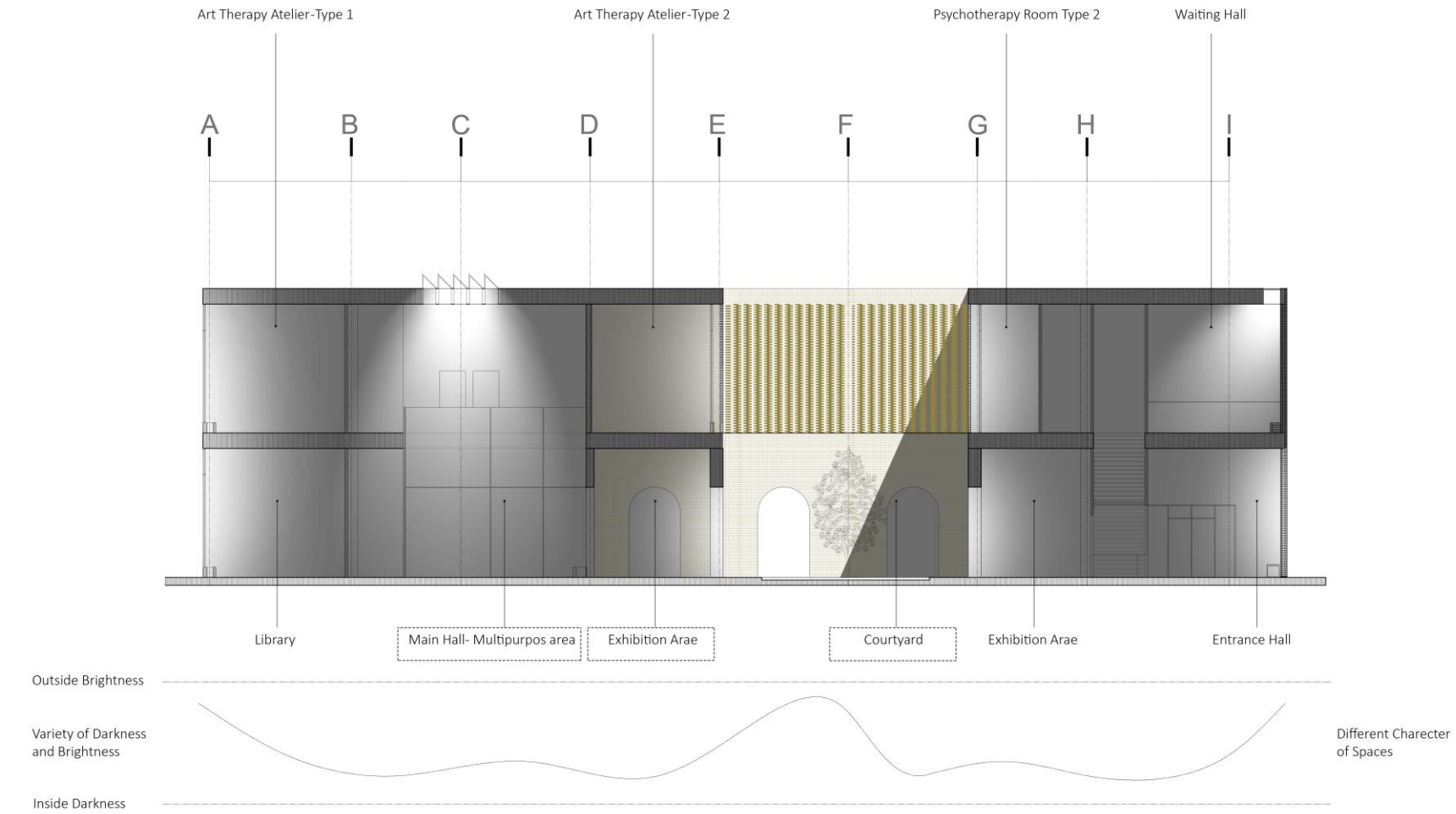


Figure 134 Light condition section

Figure 135 Render to southern elevation

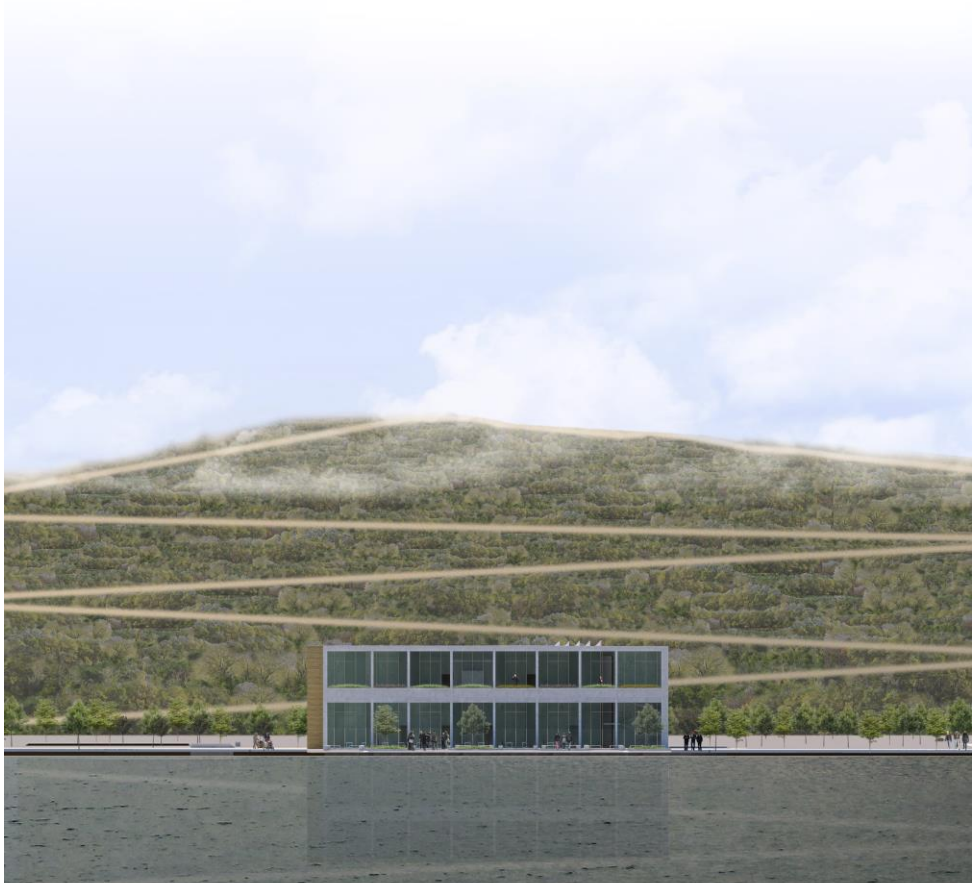


Figure 136 View from lake to green hills

Conclusion

8. Conclusion

Through my studies and design process, I found out that light is one of the crucial aspects in shaping the atmosphere. However, I believe that light is the most prominent environmental element since it enables all the other elements to find meaning. Apart from importance of natural light on the atmosphere, it can directly effect on user's mood due to its biological and psychological influences.

In architecture design, the significant parameters to control the light can be divided into two categories. The first one is design of openings and light controllers in small scale. The second one is in much larger scale which is the shape and typology of architecture.

With the aids of visualization software, I noticed how varied factors of openings and controller can effect on the intensity and quality of daylight. Moreover, through further studies related to both historical and contemporary case studies, I appreciated the importance of architectural typology. Which In this case is how the inward or outward typology can affect on the penetration of light and its sequential effects on atmosphere.

Furthermore, it is evident that light is available through openings which at the same time define the privacy of the spaces. Therefore, the visual connection between interior and outdoor is merged with using daylight for illuminating the spaces. This reminds us that architects should consider the amount of openness and the type of views they provide through design of openings.

In this thesis, I focused only on one environmental aspect, although there are certainly other factors such as color, texture, sound, temperature, smell, etc. I believe that all these factors function harmoniously and architects should be aware of all their properties and characteristics. An ideal architecture with a suitable atmosphere is shaped by balancing all of the aforementioned factors.

All in all, the main goal of this study was to create specific atmospheres for specific group of people. My Iranian background helped me to understand the users environmental demands based on my knowledge of their culture, religious believes and values. However, these ideologies can differ society by society. Thus, the architects should be aware of the social context of their target group to be able to use environmental tools and create ideal atmospheres.

Bibliography

Agancy-Hamshahrionline, N. (2017). Statistics related to the rate of depression in Iran by the Minister of Health. Retrieved from http://www.hamshahrionline.ir/details/366509/Lifeskills/heathsubpage

Ahani, F. (2011). Natural light in traditional architecture of Iran: Lessons to remember. *WIT Transactions on the Built Environment*, *121*, 25–36. https://doi.org/10.2495/LIGHT110031

American Psychological Association. (2017). Cognitive Behavioral Therapy (CBT). Retrieved from https://www.apa.org/ptsd-guideline/treatments/cognitive-behavioral-therapy.aspx

Archdaily. (2013). House of Silence / FORM / Kouichi Kimura Architects. Retrieved from https://www.archdaily.com/316582/house-of-silence-form-kouichi-kimura-architects

Archdaily. (2015a). Ballarat Community Health Primary Care Centre / DesignInc | ArchDaily. https://doi.org/10.1111/j.1753-6405.2007.00098.x

Archdaily. (2015b). Health Municipal Clinic / studiolada architects. Retrieved from https://www.archdaily.com/772875/health-municipal-clinic-studiolada-architects/%3E ISSN 0719-8884

Archdaily. (2015c). SK Yee Healthy Life Centre / Ronald Lu & Partners. Retrieved from https://www.archdaily.com/590542/sk-yee-healthy-life-centre-ronald-lu-and-partners/%3E ISSN 0719-8884

Bolton, D. (2008). *What is Mental Disorder?: An Essay in Philosophy, Science, and Values International Perspectives in Philosophy & Psychiatry*. OUP Oxford.

Corrodi, M., Spechtenhauser, K., & Auer, G. (2014). *Illuminating: Natural Light in Residential Architecture*. Birkhauser Verlag GmbH. Retrieved from https://books.google.fi/books?id=FSjOjwEACAAJ

Evans, B. (1981). *Daylight in architecture*.

Folk, J. (2008). Anxiety Symptoms, Anxiety Attack Symptoms (Panic Attack Symptoms), Symptoms of Anxiety. From Anxiety Centre Website. Retrieved from https://www.anxietycentre.com/anxiety-symptoms.shtml

Forti, A. (2014). Mental Health Analysis Profiles (MhAPs): Finland, (72). https://doi.org/http://dx.doi.org/10.1787/5jz158xmxkwj-en

Geographic, N. (n.d.). Iran. Retrieved from https://kids.nationalgeographic.com/explore/countries/iran/#iran-market.jpg

Hanachi, P. (2015). Magic of light in Iranian traditional architecture (pp. 38–53). Tehran: Light in Iranian traditional art and architecture Conference. Retrieved from http://www.herampey.com/articles/ پیروز حناچی.pdf

پیروز حناچی، جادوی نور در معماری سنتی ایران (ارزیابی شیوه های بهره گیری از نور طبیعی در چهار اقلیم اصلی ایران)

Khakpour, M., Ansari, M., & Taherian, A. (2010, May). The typology of houses in old urban tissues of Rasht. *Tehran University*, 29–42.

مژگان خاکپور، مجتبی انصاری، علی طاهرنیان، گونه شناسی خانه های بافت قدیم شهر رشت

Madanipour, A. (2019). Tehrān NATIONAL CAPITAL, IRAN. Retrieved from https://www.britannica.com/place/Tehran

Moradi, M., Mahdavipour, H., & Ghasemi, M. (2013). Daylight in Iranian Traditional

Bazar. In *Iran Lighting Design Conference*. Shiraz. Retrieved from https://www.civilica.com/Paper-ILDC01-ILDC01_072.html %0A

معین مرادی، حسین مهدوی پور، محسن قاسمی، نورپردازی طبیعی در بازار های سنتی ایران

National Institute for Health and Care Excellence. (2010). *The NICE guideline on the treatment and management of depression in adults*. *NICE guidelines [CG90]*.

Noorbala, A. A., Abbas, S., Yazdi, B., Lari, M. A., Reza, M., & Mahdavi, V. (2011). *Iranian Journal of Psychiatry and Clinical Psychology*, *16*(4), 479–483. Retrieved from http://ijpcp.iums.ac.ir/article-1-1212-en.html

احمد نور بالا، عباس یزدی، محسن اسدی، محمدرضا واعظ مهدوی، وضعیت سلامت روانی افراد 15 ساله و بالا تر شهر تهران

Öhman, A. (2000). *Fear and anxiety: Evolutionary, cognitive, and clinical perspectives*. New York: The Guilford Press.

Sharifi, V., Amin-Esmaili, M., Hajebi, A., Motevalian, A., Radgoodarzi, R., Hafezi, M., & Rahimi-Movaghar, A. (2015). Twelve-month Prevalence and Correlates of Psychiatric Disorders in Iran: The Iranian Mental Health Survey, 2011, *18*(2), 76–84.

Strong, P. D. T. G., Hons, B. S., Oxon, D. P., & Fcibse, C. E. (2014). Daylight benefits in healthcare buildings. Retrieved from https://www.designingbuildings.co.uk/wiki/Daylight_benefits_in_healthcare_buildings

Tehran Municipality. (n.d.). District 22's birth history. Retrieved from http://region22.tehran.ir/Default.aspx?tabid=486

Varkie C, T. (2010). HEAT GAINS and LOSSES : WINDOWS and SKYLIGHTS (Glass). Retrieved from http://energy-models.com/heat-gains-and-losses-windows-and-skylights-glass

Veitch, R., & Arkkelin, D. (1995). *Environmental psychology: An interdisciplinary perspective*. New Jeresy.

Vidal Fontenelle, C. (2008). The importance of lighting to the experience of architecture -the lighting approach in architectural competitions, (December).

WHO. (2001). World health report, 2001. Retrieved from http://www.who.int/whr/2001/media_centre/press_release/en/

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